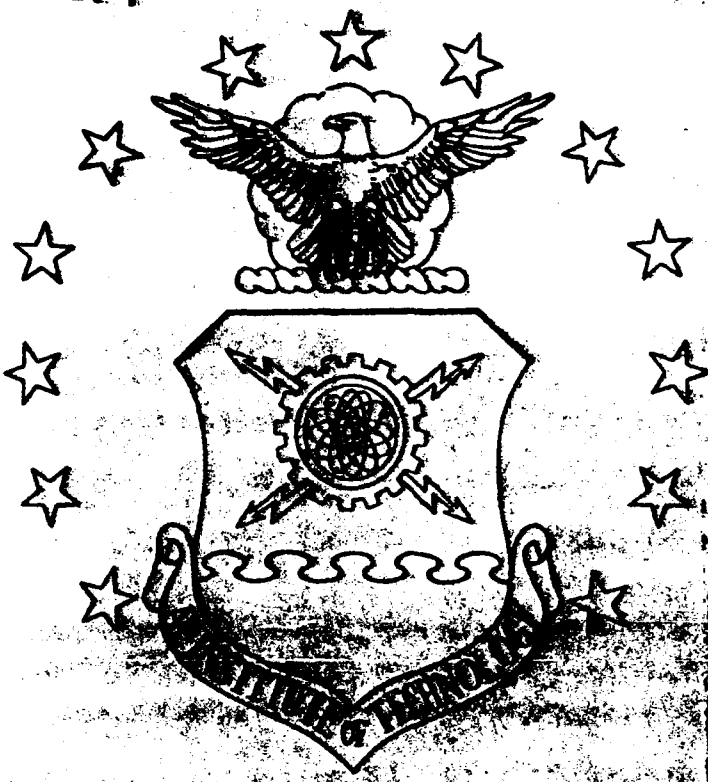

AN EVALUATION OF THE EDUCATIONAL BACKGROUND AND KNOWLEDGE BASE OF AIR FORCE INFORMATION MANAGEMENT OFFICERS

Thesis

Summer E. Scott, Captain, USAF

AFIT GIR LSR 90D-10

DEPARTMENT OF THE AIR FORCE
AIR UNIVERSITY
AIR FORCE INSTITUTE OF TECHNOLOGY
Wright-Patterson Air Force Base, Ohio

The opinions and conclusions in this paper are those of the author and are not intended to represent the official position of the DOD, USAF, or any other government agency.

AFIT/GIR/LSR/90D-10

AN EVALUATION OF THE EDUCATIONAL BACKGROUND AND KNOWLEDGE BASE OF AIR FORCE INFORMATION MANAGEMENT OFFICERS

THESIS

Presented to the Faculty of the School of Systems and
Logistics of the Air Force Institute of Technology
Air University
In Partial Fulfillment of the
Requirements for the Degree of
Master of Science in Information Resource Management

Summer E. Scott, B.S.
Captain, USAF

December 1990

Preface

This study compares the educational background and knowledge base recommended for Information Management professionals to that currently possessed by Air Force Information Management officers. The conversion of the Administration career field to the Information Management career field was more than merely a name change; it signalled the beginning of the transition from a non-technical administration mission to a more technical information management mission. As a result of this change, many officers were unprepared educationally for their new roles and duties. A comparison--using the Association for Computing Machinery's standard--between the educational background recommended for IM professionals and those actually possessed by today's Air Force Information Management officers provides an assessment of the career field's educational strengths and weaknesses. The findings of this thesis are that, on the whole, Air Force IM officers do not possess the educational background recommended for IM professionals; they have weaknesses in the areas of computers, systems, and models.

In the process writing and preparing this thesis I have had a great deal of help from others. I am deeply indebted to my faculty advisor, Dr. David K. Vaughan, for his

patience, assistance, and guidance. I also express my appreciation to Major Clyde Caufield for his assistance with my statistical analysis. A special word of thanks is also owed to my dear friend Teresa Byrd who spent her vacation helping me prepare this thesis for publication. Also, I wish to thank my close friend Mike Morris whose unmatched academic and comedic talents encouraged me to forge ahead when I could see no light at the end of the tunnel. Finally, I wish to thank the most important person in my life, my husband Ken. Despite our year and half separation, he was always there with support, comfort, and, most of all, money to pay the long distance phone bills.

Summer E. Scott

Table of Contents

List of Tables

Abstract

This study compares the educational background and knowledge base recommended for Information Management professionals to that currently possessed by Air Force Information Management (IM) officers. Areas of interest include the Air Force IM mission, recommendations concerning the proper educational background and skills for information managers, and perceptions of Air Force IM officers as to their educational background and skills. The literature review revealed that information managers should have an educational background that provides them with knowledge in the areas of people, computers, systems, models, organization, and society. Statistics made available through the Air Force Manpower and Personnel Center (AFMPC) indicated that only 2.1% of all 70XX officers have a complete information resource management background, and only 7% have a technical or computer-related background. A survey of 225 functional IM officers (of which 163 were returned--a response rate of 72.4%) revealed that today's officers do indeed use, possess, and need training in certain IM skills. This information combined with that from the literature review and AFMPC statistics formed the basis of the conclusion to this thesis--on the whole, today's

Information Management officers do not have the type of educational backgrounds that are recommended for Information Management professionals.

AN EVALUATION OF THE EDUCATIONAL BACKGROUND AND KNOWLEDGE BASE OF AIR FORCE INFORMATION MANAGEMENT OFFICERS

I. Introduction

Overview

This chapter provides background information concerning the general issues of this study, purpose of the study, its specific objectives, the scope of the study's research and application, and definitions of important terms.

Background

The transition of our society over the past 150 years from industrial-based to services-based has brought about a variety of changes--most significantly, the recognition of information as a resource. This recognition of information as a resource has been the basis for phrases such as "the information age" and "information economy" (22:v).

In order to deal with this new philosophy and reality, organizations, both civilian and military, have undergone significant changes. Although the changes in the civilian sector are important, this thesis focuses on changes in the military, and specifically, in the Air Force.

The April 1989 conversion of the Administration career field to one of Information Management signalled the true beginning of the "information age" in the Air Force.

Althoug. the change occurred recently, the events leading up to it began in 1980. The fundamental directives that were the basis for the conversion can be traced to acts of Congress, specifically the Paperwork Reduction Act of 1980, the Paperwork Reduction Reauthorization Act of 1986, and the Goldwater-Nichols Department of Defense Reorganizat on Act of 1986 (Public law 99-433) (16:1). These directives or laws were implemented in the Air Force through three Secretary of the Air Force Orders (SAFOs)--SAFO 110.1, 19 November 1987; SAFO 100.1, 21 April 1988; and SAFO 560.1, 7 September 1988 (33:1). SAFO 110.1 established the authorities and duties of the Administrative Assistant to the Secretary of the Air Force which allowed Administration issues to be dealt with at the Secretary of the Air Force (SECAF) level (15:1). Additionally, SAFO 100.1 defined the functions of the Secretary, the Under Secretary, and the Assistant Secretaries of the Air Force (14:1). Finally, SAFO 560.1 incorporated the intentions of the two previous SAFOs and formally established the Air Force Information Resources Management (IRM) program (16:1). Combined, the three SAFOs defined the scope and responsibilities of IRM in the Air Force (33:1).

Once the order to establish an Information Resources Management Program in the Air Force was given, it became

necessary to assign the new responsibilities to a particular career field. By doing so, the new responsibility of Information Resources Management could receive the attention and direction it would need. Subsequently, the Administration career field was chosen.

With the decision finalized, the leaders of the Administration career field began to implement the new mission changes by first rewriting AFR 4-1, Functions and Responsibilities of Information Management (IM) Activities. The revision of this regulation ensured that specific guidance concerning the new mission was available in the field. The next major move toward IM was the redesignation of the career field from Administration to Informatio Management. On 1 April 1988, the Administration career field was formally redesignated the Information Management career field, and all Administrators became Information Managers (IMs).

Despite the new mission, no provisions were made to educate or train the members of the career field in their new responsibilities. Essentially, Administrators became Information Managers and were expected to fulfill their new duties without additional training.

Focus

Although the conversion of the career field has affected officers, enlisted members and civilians alike, the

focus of this study will be limited to the effects on officers. Specifically, this study addresses whether Air Force IM officers possess the educational background and knowledge base necessary to perform skills associated with the new mission of Information Resource Management (IRM).

Before continuing, however, it is necessary to clarify the context in which the terms educational background and knowledge base will be used in this research. In many previous studies of this type, the words education, knowledge, knowledge of, knowledge base, skill and training have been used interchangeably and without clear delineation (37:395). In this study, the following definitions will apply:

> Education is distinguishable from training: education is a long-term activity designed to build a foundation of knowledge [hence knowledge of and knowledge base] and reasoning abilities. Training is a short-term activity with a specific goal. Training builds upon an educational foundation to develop a skill or teach performance of a process rather than a reasoning about a process. (22:595)

Furthermore, "skill is defined as the ability to perform specialized work with recognized proficiency" (37:395).

From these definitions it is evident that the relationship between education, training and skill is hierarchical. Education, as a long-term activity, lays a broad base for the shorter-term activity, training.

Training then cultivates skills which can be viewed as the smallest, recognizable result of both (education and training). Skills are the ultimate indications of education and training. Although the primary focus of this research is on the educational background and knowledge base of IMs currently in the field, it is necessary to garner this information by focusing on specific skills. Because education can be the result of schooling, job experiences, seminars, hobbies, and life experience, it is almost impossible to pinpoint whether an individual has an "appropriate" IM educational background. This thesis will use "skills possessed" and "training deemed necessary" as an indication of the true educational background and knowledge base of the IM officer corps.

The perception that IM officers may not possess the necessary educational background and knowledge base originates from two sources: 1) literature that cites critical fields of knowledge for those involved in IRM; and 2) Air Force regulations that specify skills which Information Managers should be able to perform.

Concerning the first of the two areas, a variety of literature describes the field of Management Information Systems (MIS) as a combination of a number of other academic disciplines (13:13-15). This literature explains that to be truly well-versed in the MIS field, one must be

knowledgeable in the areas of computer science, organizational and management theory, operations research, and accounting. In addition, the recommended curriculum requirements for IM students list knowledge and abilities in concepts relating to people, mathematical models, and computer systems as necessary to work effectively in the field (1:370). These ideas are central in determining whether an individual possesses the proper educational background and knowledge base to perform IRM duties.

The second area of concern stems from AFRs 4-1 and 36-1. These new regulations set forth new tasks and responsibilities for the Administration officer turned Information Manager. For example, the 30 June 1982 AFR 4-1 makes no mention of the need to be familiar with the design of information systems, while the new AFR 4-1, 30 Dec 88, specifically states that one of the responsibilities of Information Managers is the "design or redesign of systems" and "[the reviewing] and monitoring of base-level management information systems requirements" (17:17;18:10).

These ideas are the basis for this study and the null hypothesis: Information Management officers do not possess the educational background and knowledge base recommended (by literature) for information management professionals. The alternate hypothesis is that they do possess the proper background and knowledge base.

Purpose

The purpose of this study is to investigate the actual educational background and knowledge base of Air Force IM officers as compared to the background and knowledge base suggested by literature for all IM professionals. This study will also identify areas of knowledge and skill IM officers perceive as necessary to the performance of the new mission. As a result, the study will determine if there are specific areas of education and knowledge which IM officers are lacking and if there exists a need for additional education and training for officers in those same areas. Some evidence suggests officers in the career field may be lacking the proper educational foundation and knowledge base to accomplish the new IM functions. For example, an extensive review of the career field conducted in the early 1980s by SAF/AADH concluded that the IM (Administration at that time) officer corps did not have the educational background needed to perform an IRM mission (52:1). More recently, the same office (SAF/AADH) conducted another audit which focused solely on the educational background of Captains assigned to the career field. This study identified only 33 of 1000 Captains with a sufficient (as determined by SAF/AADH) IM background (28:1). Consequently, the results of this study will provide specific guidance for

both future IM officer training plans and the recruitment of new IM officers.

Specific Objective

The specific objective of this study is to determine if the current corps of Information Management officers possesses the educational background and knowledge base necessary to perform the skills required of the new information management mission.

Investigative Questions

Accomplishing the specific objective requires answering the following investigative questions:

1. How does the new mission of information management differ from that of administration?
2. What are the educational background and knowledge base recommended by the literature for information management professionals?
3. What are the skills recommended by the literature for information management professionals?
4. What are the educational backgrounds of officers currently assigned to the IM career field?
5. Which skills do IM officers perceive as essential to performing the new mission?
6. Which skills are IM officers are currently using on the job?

7. In which skills do IM officers perceive they need training?

Scope

The scope of this study is limited to 70XX officers currently assigned against Functional Account Code (FAC) 1100 billets. Although any 70XX officer is eligible to fill a FAC 1100 billet, it is evident that those presently performing non-FAC 1100 duties have yet to be significantly impacted by the changes in the career field mission. The May 1988 Occupational Survey Report of the Information Management (then Administration) career field conducted by the USAF Occupational Measurement Center indicated that few non-FAC 1100 officers perform information management activities in the course of their daily duties (50:27,3-2,41,C1-4). For this reason, non-FAC 1100 officers have been excluded from this study.

Although this study addresses the necessary educational backgrounds of IM officers and assesses perceptions of needed knowledge and skills essential to performing the IM mission, due to differing job requirements, it is not directly applicable to enlisted or civilian sectors of the career field. Efforts concerning the same issues and directed toward these groups, however, would be appropriate for follow-on research.

Definitions

Due to the relative "newness" of the field, many terms associated with information management are difficult to define. In addition, some terms are used interchangeably. The following definitions of terms will aid the reader in discerning their meanings as they apply in this study:

Management Information System (MIS)--An integrated, user-machine system for providing information to support operations, management, analysis, and decision-making functions in an organization. The system utilizes computer hardware and software; manual procedures; models for analysis, planning, control and decision making; and a database (13:6).

Information Resources Management (IRM)--The management of data, people and processes which produce information that serves a business or functional need. It focuses on enhancing productivity within an organization by taking a comprehensive view of systems development. In many instances. IRM is a term used by the Federal government in lieu of Management Information Systems (MIS).

Information Management (IM)--refer to Information Resource Management.

Information Manager (also abbreviated IM)--One who practices information resources management as defined previously. In the Air Force, these individuals are officers, enlisted, or civilian members of the 70XX career field.

Systems Analyst--A term closely related to information manager. Specifically, a systems analyst gathers data for analysis of user applications/problem areas in order to design and develop new applications or to modify existing applications (37:404). Although an information manager's duties are much broader, many duties mirror those of a systems analyst. In this study, the term systems analyst will be used only in the instances where it is equivalent to that defined as an information manager.

Functional Account Code 1100 (FAC 1100)--A FAC is a code used by the Air Force to identify homogenous groupings of tasks. FAC 1100 is the code that specifically identifies functional information management tasks as opposed to executive or support tasks.

Organization of Thesis

Chapter I contains an introduction to the study which includes background on the general issue from which the

specific research questions evolved, the focus and purposes of the study, specific research objective, and investigative questions, the scope of the study, and definitions of key terms.

Chapter II contains a review of the literature relevant to this study. Topics addressed are recent changes to the information management career field, mission of the new career field, areas of study recommended for information managers, and curriculum recommendations for IMs. Investigative questions I and II will be answered through this literature review.

Chapter III discusses the methodology that is used to solve specific problems and outline the procedures for data analysis.

Chapter IV contains an analysis of the collected data and, in turn, answers to the remaining investigative questions.

Chapter V presents the findings of this study and uses them as a basis for conclusions and recommendations.

II. Literature Review

Introduction

This review presents literature that is applicable to research concerning the educational background of Air Force IM officers. Specifically, this review addresses the history of IRM, skills needed by IM professionals, curriculum recommendations for the education of IM professionals, and predictions for the future of the IRM field.

History

The industrial society in which we have been living for the past 150 years has transitioned to a services-based society (25:v). This fundamental change has allowed information to become a strategic resource--a resource that in many cases is equal in importance to factories and machines. Consideration of information as a resource has led to the development of what we know as Information Resources Management (IRM) (44:257).

As the transition to a services-based society led to the recognition of information as a resource, the concept of IRM slowly developed. Within the past 40 years (30:17), however, it has experienced some unpopularity due to its lack of clear definition. In many instances, it has been

found that IRM is defined according to the organizational and technological context in which it is used. Trauth and Lee summarize the events which they believe are responsible for the differing concepts of IRM in use today.

Trauth. In "The Evolution of Information Resource Management," Trauth states that "the IRM concept evolved in three different arenas with little interaction occurring among them." These three arenas or disciplines were database management, records management, and data processing management. She also adds that "IRM grew and developed into two societal sectors: the private sector and Federal agencies." These different points of origin, in her words, "partially explain the wide variation in the meaning of the term." However, she recognizes that these differing views have converged. The reason for this convergence is that "there have been those in each of the three disciplines who saw their fields as providing a piece of the solution" (44:257-258). She describes this new view as follows:

> According to the convergent view, there are three primary goals of IRM. First, there should be a global view of the corporate data which incorporates both database systems and documents. Second, the management functions should be positioned at a higher level within the management structure. Finally, both the information handling technologies and function, and data should be integrated. (44:265)

While definitions for IRM abound, Trauth explains the following definition covers most.

> IRM is a synthesis of several approaches that have been demonstrated to be useful in managing information. It combines general management, library science, and policy making and planning approaches. It is the next step in the evolution of information management thought and not a panacea or fully developed approach. (44:264)

Lee. Lee, unlike Trauth, sees the evolution of the IRM concept as it is related to advancements in information technologies, organizational evolution, application development, and information use (30:17). In the evolutions of information technologies, Lee states that first was data processing (DP), second came Management Information Systems (MIS), and IRM is now evolving. He explains that IRM has appeared as a result of the revolution of both hardware/software technology and the process of information handling. He concludes that a working definition of IRM is:

> The planning, organizing, controlling, securing, and integrating of the organization's information resources, including:
> - -Internal and External Information (Data, Text, Graphic, Video, Voice)
> - -Software (Systems and Applications)
> - -Hardware (Processors, Input, Output, Storage, Communications)
> - -Facilities (Buildings, Furniture, non-Computer tools)
> - -Personnel (Technical, Support, End User)
> - -Information Systems Budget (Funds)
> - -Information Systems Policy, Procedures and Methods. (30:21)

Evolution in the Federal Government. In addition to the general history of the concept of IRM, an understanding

of its evolution within the Federal government is critical to this thesis. Only during the last decade has a "comprehensive management of information and its supporting technologies come to the forefront of federal management concern" (7:9). Primarily, this "new" concern is a result of the Paperwork Reduction Act of 1980 (reauthorized in 1986), which was established to address the management of "federal reporting requirements and technology integration and applications" (7:9). Sharon L. Caudle defines IRM from the Federal government perspective:

> [IRM is] the planning, budgeting, organizing, directing, training, promoting, controlling and other managerial activities involved with the collection or creation, use and dissemination of information by Federal departments and agencies. (7:9)

She points out that emphasis is on information burden and the management of related resources, such as automated data processing (ADP) equipment (7:9). Caudle maintains that from the beginning the emphasis on "resources" was intentional. Working on the Act's passage in the late 1970s, the Commission on Federal Paperwork promoted the idea that information should be managed in the same manner as more tangible resources, such as money and people, and not considered a "free good" unsubject to management control. Eventually, the Act reinforced this idea.

> The most powerful requirements of the Act were the designation of senior IRM officials in each agency, oversight of information collection, triennial reviews

of information management activities, and five-year information technology plans. (7:9)

Evolution in the Air Force. The designation of senior IRM officials in each agency coupled with the results of the Goldwater-Nichols Defense Reorganization Act of 1986 prompted the Air Force to become officially involved in IRM (33:1). Subsequently, three separate Secretary of the Air Force Orders (SAFOs) directed implementation of the reorganization and delegation of the new IRM responsibilities. Specifically, these three orders were SAFO 110.1, Authorities and Duties of the Administrative Assistant to the Secretary of the Air Force (19 Nov 87); SAFO 100.1, Functions of the Secretary, Under Secretary and the Assistant Secretaries of the Air Force (21 Apr 88); and SAFO 560-1, The Air Force Information Resources Management Program (7 Sep 88) (33:1). In addition to providing guidance for the Air Force IRM program, these orders directed the conversion of the Administration career field to one of Information Management. This conversion, in effect, designated a single career field as the Air Force IRM office of primary responsibility.

In order to capsulize the drastic changes to the career field in structure and in mission, Colonel William O. Nations, Director of Information Management and Administration, wrote:

> SAFO 560.1 appoints the Assistant Secretary of the Air Force (Acquisition) (SAF/AQ) as the Senior Air Force IRM official. The Administrative Assistant to the Secretary of the Air Force (SAF/AA) is responsible to SAF/AQ for the information management (IM) activities in the Air Force IRM program. SAFO 100.1. . . describes, in broad terms, the general responsibilities of SAF/AQ as they pertain to the Air Force IRM program. SAFO 560.1 gives more focus on IRM responsibilities. (Finally), SAFO 110.1 describes the specific responsibilities of SAF/AA as they relate to IM activities. (33:1)

Despite the early efforts to inform the career field of these changes, the "news" was not well publicized nor readily available. A clear picture of the new IRM mission did not materialize until publication of the revised 4-series (those pertaining to IM) regulations. On the whole, the new publications reflected a change in mission orientation from administrative to technical. The following comparison of the "old" AFR 4-1, Functions and Responsibilities of Administration (30 Jun 82), and the "new" AFR 4-1, Functions and Responsibilities of Information Management Activities (30 Dec 88), shows some of the major changes the new mission brought about. The June 1982 AFR 4-1 states:

> The general mission of administration is to provide systems, services, resources, and procedures of the processing of information in all Air Force organizations. The functions involved in filling this responsibility are organized into three major areas: 1) administration policy... 2) administration program management... and 3) administration operations. (17:1)

The most recent AFR 4-1 describes the new mission in much greater detail:

> The mission of IM is to propose, develop, and implement policy to manage information in any form throughout its life cycle in support of the Air Force mission. IM includes information collection, paperwork reduction, statistical activities, records, forms and publications management, privacy and security of records, data standards, and sharing and dissemination of information. In addition, IM includes planning, programming, budgeting, training, evaluating, directing, promoting, and managing this valuable resource. It uses a variety of technologies but is independent of the policy of acquisition management of these technologies. The functions for fulfilling the responsibilities (are organized) into three major areas: 1) information management policy; 2)information program management and analysis; and 3) information management activities. (18:1)

An examination of the above mission statements indicates that there is distinct difference between Administration and Information Management. For instance, today's information managers are expected to perform statistical activities, and set data standards, as well as direct and promote information management (18:1). Furthermore, new responsibilities of the career field include:

1) managing facsimile mail;
2) managing electronic mail;
3) maintenance of standard electronic mail addresses;
4) establishing electronic publishing systems;
5) managing automated IM printing systems and assisting users in developing system specifications, equipment configuration and information workflow practices to ensure Air Force-wide common goals for printing systems;
6) reviewing hardware/software/information requirements;
7) assisting users in managing information systems and developing requirements;
8) monitoring base-level MIS requirements;

9) training base-wide IM personnel;
10) training of IM standard systems. (18:7-11)

As leaders became more familiar with new responsibilities, they began to recognize that individuals in the career field lacked the expertise needed to accomplish the IM mission. Suddenly, the Air Force IM community was faced with a problem which had been recognized by private industry for quite some time--shortage of IM qualified personnel. Though the problem in the private sector was not a result of identical circumstances, a look at the research concerning the problem (in the private sector) is appropriate to this thesis. Such research provides a background from which the Air Force can benefit.

Previous Studies

Several studies have been conducted to determine the skills needed by an IM or MIS professional, and also to provide a proper curriculum as a basis for education and training. A summary of some of these studies is provided below; a more detailed description of specific skills and curriculum is provided later in this paper.

In the working paper titled, "Systems Analysis Skills Hierarchy," Nestor Guimaraes states that:

> in these days and times . . . the bottleneck to greater computer utilization is not caused by deficiencies in equipment but primarily by the shortage of properly

> trained professionals who can better design, develop and implement computer applications. (23:1)

Trevor Crossman expresses virtually the same idea in his study of skills needed by systems analysts of the future.

> It is generally accepted that an obstruction to progress of greater utilization of computer technology is caused, not so much by deficiencies in the technology itself, but rather by shortages in Information Systems personnel with the skills to develop and implement viable computer based operations. (37:394)

These IS personnel and skill shortages are documented in a variety of publications (37:394;23:1;42:1).

Cheney and Lyons. One such study, conducted by Paul H. Cheney and Norman R. Lyons, focuses on employment trends and skill requirements in the information systems arena as seen by the information systems managers of 32 of the nation's largest organizations. Their conclusions are that the demand for information systems personnel is going up at a very rapid rate. They say the demand should remain constant for quite some time. Their survey of skill areas shows employers are demanding a combination of technical and managerial skills (8:42-43).

Vitalari. Another study, conducted by Nichols P. Vitalari, explores the knowledge base, as opposed to specific skills, needed by a systems analyst. Because knowledge is necessary for skill, this study is particularly applicable. The core categories of knowledge Vitalari

identifies are: organization specific knowledge, high-rated knowledge, knowledge of techniques and methods, applications domain knowledge, functional domain knowledge, and core system analysis domain knowledge (51:237). These findings allow an in-depth view of what comprises the knowledge base of a competent systems analyst.

Guimaraes. A study published by Nestor Guimaraes uses the traditional development life cycle as a framework for identifying skills systems analysts should possess. Guimaraes uses a hierarchical approach in which skills are partitioned into their functional prerequisites. Overall, Guimaraes categorizes 127 skills into nine clusters associated with the development life cycle. This research is important because it represents an approach to skills classification unlike any other (see Appendix A).

Crossman. Trevor Crossman, in his study, "Skills Required by the Systems Analyst of the Future," acknowledges the prior research mentioned above, but attempts to take the findings a step further by concentrating primarily on future skill requirements. His major findings are that both experts and systems analysts alike believe that analysis skills, social and communication skills, database skills, systems control and security, and fourth generation language skills will be increasingly important in the future. He concludes that for systems analysts to remain employable,

they must possess skills that include a broad spectrum of technical (system building) skills, business skills, and interpersonal relationship skills (37:393-403).

Culnan and Swanson. A final study that addresses the knowledge with which the field of MIS encompasses is Culnan and Swanson's, "Research in MIS, 1980-1984: Points of Work and Reference." In this article, the authors examine the progress of MIS as a scholarly field of study from 1980-1984. They state:

> In this examination, MIS is identified as emerging from a supporting base of three foundational fields: computer science, management science, and organization science. While these...three fields...are held to be necessary to the development of the MIS field, it is recognized that other fields have contributed directly, as well as indirectly, to MIS development. (10: 289)

Although Culnan and Swanson attempt to identify work that is "uniquely MIS" (which they do on some occasions), it remains obvious that much of MIS research evolves from the fields of computer science, management science, and organization science (10:290-300). It follows that IMs must possess knowledge/skills in these areas.

Skills

In the wake of the recent popularity of MIS and the associated concern about the availability of qualified IS personnel, numerous efforts have been made to identify the varied skills necessary to the profession. The

identification of necessary skills is paramount in designing an appropriate curriculum and/or training program. While some literature addresses this topic in a summary nature, other literature goes into detail by supplying a "full-blown" skills list. Much of the summary nature material has been addressed in a previous portion of this paper; however, some additional material is more appropriate here. Both types of literature are addressed because the combination of references concerning desired skills will provide the basis for the questionnaire used in this thesis.

ACM Skills. One of the first organizations to attempt to isolate the skills needed by IS professionals was the Association of Computing Machinery's Curriculum Committee on Information Systems. This organization first convened in 1972 and 1973. The committee was formed in response to the growing need for individuals who could "bring to bear the relevant computer technology on the information requirements of particular organizations" (1:365). The product of their work was not only the extensive skills listing found at Appendix B, but an IS curriculum recommendation (addressed in a later section).

Guimaraes' Skills. Nestor Guimaraes also produced an extensive skills listing in which he organized the skills in categories as they apply to the development life cycle. These categories are: Phase 1--Feasibility Study,

Phase 2--System Analysis, Phase 3--System Design, Phase 4--Program Design, Phase 5--Programming, Phase 6--System Testing, Phase 7--Implementation, Phase 8--System Audit, Phase 9--Maintenance, and Phase 10--Skills Used in All Phases (23:4-5). A complete listing of these skills can be found in Appendix A.

Crossman's Skills. Crossman, as mentioned before, identified skills that will be needed by systems analysts of the future. A complete listing of these skills can be found in Appendix C. Crossman observed that IS experts (defined as a sample of Who's Who in Computers) and on-the-job systems analysts do not necessarily agree on the relative importance of all skills. Crossman generally found that, in the cases where there was disagreement, it is the systems analysts who regarded a skill as more significant than the importance given to it by experts (37:402). He explains:

> Some of the issues on which there was disagreement were not expected. Of particular concern was the lack of agreement on the need for skills in both business practices and some traditional analyst activities (both groups of skills were regarded by systems expert as important). (37:402)

It is obvious from additional literature that Crossman keyed upon an important point. More recent publications stress that business skills are becoming more and more important for the success of IS professionals. Because the

Air Force, in many ways, operates much like a business, a brief synopsis of this literature is appropriate.

Business Skills. In their article, "Test MBA Programs for Reality," Patricia Carlson and James C. Wetherbe find that:

> Some organizations are starting to hire MBA graduates who have concentrated in fields such as marketing to help ensure that they get people with the ability to communicate and sell ideas effectively. Other organizations are using personality tests and batteries of interviews to eliminate MIS MBAs who reflect a technical rather than human relations outlook on what management is all about. (6:101)

As quoted by John Kirkley, R. Talmadge Fish, Manager of Information Systems at Burlington Industries, holds similar ideas.

> Today's and tomorrow's MIS managers must have a much better feel for the business direction of the corporation. We hire very few pure computer science graduates. Instead, we employ people with a business degree and a minor in information science. This is more and more a definite trend. (29:80-81)

Other publications express related thoughts. John Gantz says in Tech Street:

> We're talking career changes for MIS professionals. Everybody will be a technologist, and individuals will move forward in their careers based on their ability to further the business goals of their companies. (21:38)

Rouse and Hartog, in "The New MIS Professional-Part 1," explain that changes are occurring in the field, one of which is that "MIS organizations are becoming more business oriented" (41:6).

Air Force IM Officer Skills. Before ending a discussion concerning the skills of IS or IM professionals, it is critical to examine the documentation which outlines those expected of Air Force Information Management officers. Despite the evidence that the government has not yet fully embraced the concept of IRM (7:10), the Air Force has made a first attempt to define what education and skills it expects of its "new" Information Management officers. In the recent revision of AFR 36-1, Officer Classification, the change from an Administration to Information Management philosophy is evident. The duties and responsibilities of all 70XX officers in many respects remain the same; however, the additional information management responsibilities are definitely of a technical nature. Some examples of these new duties are:

1) Planning information management office layouts and workflow;
2) Determining requirements for office information systems;
3) Developing internal information systems to accomplish upper and command management objectives.

In addition, the knowledge, education, and training requirements have been altered significantly. Knowledge requirements now include information systems. The desirable background has been expanded to include academic specialization in IRM, systems management, and computer technology. And, finally, training specifications have been upgraded to include systems and computer or information

technology (17:atch 16; 18:atch 15.1). A one-to-one comparison of qualification changes can be found in Appendix D.

Shortage of Skilled Personnel. In spite of this new guidance and direction, available literature (of which there is a lack) indicates that Air Force IM officer corps is deficient in the areas of IM knowledge and skills. In a study in which the Air Force participated, it was noted that:

> Almost one half of the bureau managers believe that staff and skills are inadequate, particularly if the manager is trying to put together a viable IRM structure. (7:11)

Another government organization, the Office of Management and Budget (OMB), also recognizes the growing need for IS skills. In its revision to the Five Year ADP and Telecommunications Plan, the OMB anticipates two trends in government information systems from now until the year 2000--the amount of computing power needed by federal agencies will continue to grow (hence, a growing need for personnel skilled at harnessing that power), and technology purchased will change the way we do business (31:95).

This "skills crunch" is evident in the private sector as well (31:95). Michael Sullivan-Trainor quotes one IS manager as saying, "The lack of an experienced professional is slowing the company's installation of a mainframe communications network" (42:117). In a poll of

100 MIS managers, Sullivan-Trainor finds that 23% believe their MIS employee shortages are caused by a lack of education and training (42:117). In an article, entitled "Top Students Shunning MIS," Glenn Rifkin cites the computer industry slump of the late 1980s and the growing unsettledness of the field as the primary reasons for the declining interest in MIS as a career. He explains that the lack of interest is creating a growing crisis in MIS education (39:1).

Curriculum

ACM Recommendations. The ACM Curriculum Committee on Information Systems, mentioned earlier, was the first organization formed to address the problems of MIS education. The committee's primary goal was to recommend a structure of professional programs for use in institutions of higher learning. In doing so, the committee first recognized the absence of a clear definition of the functions performed by information systems personnel. To compensate, the committee made its recommendations applicable to all personnel who were in some way responsible for the operations/management of information systems despite position title or location in the organizational structure (1:367-368). Also, they worked on the assumption that:

> The knowledge and abilities necessary to work effectively in (the) field may be characterized as obtainable by integrating concepts relating to people,

models, and systems for the applications of computer technology in the context of organizations and society. (1:370)

Their recommendations were specifically aimed at undergraduate and graduate degree programs. Other programs--two-year and business school--have been proposed, but are not applicable to this research. This event was important to the IM community because it represented the first attempt to specify a curriculum primarily for IS personnel. The ACM Curriculum Committee convened once again in 1982 to update the earlier curriculum based on advances in the field (2:781). Because the 1982 curriculum recommendations are the most recent, they are used as a basis for this thesis.

The 1982 recommendations do not specify a single background for students entering the information systems curriculum. However, the committee does recognize several areas of knowledge as a prerequisite to entering the program. They are classified as general and specific prerequisites:

General Prerequisites:

(i) finite mathematics, including the fundamentals of formal logic, sets and relations, and linear algebra
(ii) elementary statistics, including the fundamentals of probability, expected value, and construction of sample estimates
(iii) elementary computer programming, including problem analysis and algorithm synthesis, and competence in a higher level language.

(iv) elementary economics, including microeconomics and theory of the firm and price theory
(v) elementary psychology, including fundamentals of personality formation, attitudes, and motivation.

Specific Prerequisites

(i) courses on computer programming
(ii) courses on quantitative methods (2:786)

Following the general and specific prerequisites, the degree program in information systems has three components with a set of courses for each. The three components are: information systems technology, information systems concepts in organizations, and the American Assembly of Collegiate Schools of Business (AACSB) common body of knowledge. The set of courses for each and the general curriculum structure are listed in Appendix E. Although the old and new curricula are similar, the latter proposes a decreased number of courses for the Master's program (10 as opposed to 13) and eight courses for the undergraduate program (2:787-788).

In a final note, the ACM Curriculum Committee recognizes that many graduate programs designed for MIS are MBAs with an IS orientation. They explain that although a limited program (an MBA without 10 MIS courses) does not qualify students to become a system designers, it does, however, allow them to become information analysts (2:788).

The ACM Curriculum Committee has gone to great lengths to develop a proper MIS curriculum framework. A review of five undergraduate and five graduate MIS programs revealed that indeed these curriculum recommendations are well accepted and used as a guideline for building MIS curricula. Of the ten programs reviewed (see Appendix G) all met the minimum ACM curriculum standards (19:3;27:insert; 34:42-46;36:123;43:293-294;45:104;46:8;47:42-43; 48:221-234;49:99-101).

DPMA Recommendations. Another prominent curriculum model comes from the Data Processing Management Association (DPMA). The DPMA model is slightly different in focus than the ACM model in that it has a business orientation. DPMA guidelines are designed primarily for IS programs offered through schools of business or through applied computer science programs which require a concentration of business courses in support of the technically oriented computer courses.

The DPMA's newest curriculum model, Computer Information System's (CIS) '86, was designed "to reflect many of the dynamic changes that have occurred in the industry" (3:21). Its specific objective is:

> to provide graduates with the knowledge, abilities, and attitudes to function effectively as applications programmer/analysts and with the educational background and desire for lifelong professional development. (11:10)

The CIS model curriculum is comprised of :

1. Eight required courses. (see Appendix F)
2. Three other CIS courses to be chosen from a set of eight recommended elective courses.
3. A minimum set of business support courses.

Although the DPMA model mirrors the ACM model in many ways, it has not been used as a standard of comparison in this thesis. The fact that it reflects a business orientation makes it less desirable (in an Air Force setting) than its ACM counterpart.

Although the ACM and DPMA Curriculum Committees' proposals are the most prevalent in the MIS field, they are not the only groups proposing IS curricula. Other related efforts have stemmed from the Institute of Electrical and Electronic Engineers (IEEE) and the International Federation of Information Processing (IFIP) (2:783). These models are not among the most prominent; therefore, they will not be used as a basis for this thesis.

Future

Some literature indicates that within the private sector the MIS profession has come full circle in the last decade (41:6;39:1). The burgeoning computer industry of the early 1980s brought with it a surge in MIS. Subsequently, users have gained more knowledge and experience and the

desperate need for MIS professionals has begun to decline. Hartog and Rouse state:

> While systems are still being developed with familiar techniques and the old cast of characters, changes are occurring that may not be apparent to those in the field. From our perspective, four themes stand out:
> -- MIS jobs are increasingly at risk
> -- MIS jobs are undergoing fundamental changes
> -- MIS organizations are becoming more business oriented
> -- MIS career responsibility falls increasingly on individuals. (41:6)

While these changes may be indicative of what private industry will experience in the next few years, it is not apparent that the same will happen in the Air Force. IRM is just beginning to unfold within the DoD (7:1). Projections for the work and workers in the year 2000 are that the fastest growing jobs will require substantially more amounts of math, language, and reasoning capabilities than current jobs do. The Air Force must concentrate its efforts on better defining the IRM mission so that it may better educate and prepare its IM personnel.

Conclusion

IRM is a concept whose time has come. The previous discussion addressed its history, skills required by its professionals, curriculum recommendations, and its predicted future. It is apparent from the discussion that IRM has evolved in many ways--organizationally and technologically--in the private sector and in Federal agencies. These

diverse origins lend to the disparity in existing definitions that describe the concept. Experts in the field of IRM in the private sector as well as in the Air Force have focused attention on the lack of skilled personnel in the discipline. Curriculum recommendations have been submitted by a variety of organizations in order to better structure educational programs for IRM professionals in hopes of relieving skill shortages. The majority of organizations which practice IRM face the same problems as mentioned earlier; however, some literature is beginning to indicate that these problems may take care of themselves as end-users become more competent.

In light of the information presented, it is obvious that IRM is alive and well. Because this discussion reflects a substantial amount of what is known about IRM--its origins, its problems, its future--it is important for Air Force Information Managers, as well as leaders. This material provides a basis for determining the proper education needed by Air Force IM officers.

III. Methodology

Overview

This chapter describes the methodology used to answer the investigative questions found in Chapter I.

Data Collection Procedures

The pertinent information necessary for this study came from three sources. The first source was an integrative review of all material relevant to the topic. The second source was information provided by the Air Force Manpower and Personnel Center (AFMPC). Finally, the third source was data compiled from a questionnaire sent to a sample population of Air Force Information Management officers.

Literature Review

A review of recent literature pertaining to Information Management established the general issue to which this topic relates. In addition to literature that addressed IM history, concepts, and general areas of knowledge and education recommended for Information Managers, curriculum recommendations of five undergraduate and graduate IM/MIS programs were reviewed. This particular information was essential in determining whether institutions offering IM/MIS programs did indeed follow the ACM curriculum

recommendations. It also enhanced information uncovered in the literature.

AFMPC Material

The information provided by AFMPC addressed the educational background of all 70XX officers. More specifically, it provided the general degree category and highest degree held by all 70XX officers. This information made it possible to evaluate, in a general manner, the types of degrees possessed by these officers. An examination of this information was critical in determining if 70XX officers, as a whole, possessed the educational background that is recommended by the literature for Information Managers.

Survey

The information necessary to compare what educational background and knowledge base Air Force IM officers possessed as compared to that recommended by literature was gathered through a survey. This survey was in the form of a self-administered questionnaire (see Appendix G). The population of interest for this survey was all Air Force IM officers assigned to FAC 1100 positions, both in the CONUS and overseas. A random sample was calculated from a population of 234 using the general formula for computing the maximum sample size from a known finite population.

$$n = \frac{N(z^2) * p(1-p)}{(N-1)*(d^2)+(z^2)*p(1-p)}$$

where: n = sample size
N = population size
p = maximum sample size factor (.50)
d = desired tolerance (.05)
z = factor of assurance (1.96) for 95% confidence level

The above provided a sample size of 146 at a confidence/reliability level of 95% + or - 5% (12:2). The survey instrument was composed of questions which addressed six areas:

1. Demographic questions to collect data on age, rank, duty AFSC, length of service, and assigned command.
2. Questions to determine the IM skills used on the job.
3. Questions to determine the IM skills possessed by individual officers.
4. Questions to determine the skills in which IM officers perceive they need training.
5. A question to determine if officers perceived the IM career field as different from Administration.
6. Summary questions to determine if officers perceived their educational background as adequate

to prepare them for the IM responsibilities of today and the future.

(QUESTIONS 2, 3, AND 4 WERE BASED ON AN EXTRACT OF THE ACM SKILLS LISTING)

The data collected from this survey was entered into a database for analysis.

Data Analysis Procedures

An analysis of the data consisted of a combination of descriptive and comparison statistics.

Descriptive Statistics. Descriptive statistics are defined as statistics that enable the precise description of a collection of quantitative information in a form that is more concise and convenient than the original collection and in a fashion that allows easy interpretation (40:2). In accordance with guidance concerning descriptive statistics, the variables to be summarized were collected as interval measurements. The use of these types of statistics allowed a variety of the data to be shown in tabular form.

Means Analysis. Once the descriptive statistics were available, an analysis of the mean responses to the survey questions (1-105) was performed. In addition to the analysis of all questions separately, the questions were also grouped into skills categories (people, computer, systems, organization, model, and society skills). The mean responses to these skills groups were also examined.

Confidence Intervals. In the instances where the mean responses indicated an overall "neither agree nor disagree" response (the neutral response on the Likert scale) further analysis was required. At this point confidence intervals around the mean were calculated. The value of 1.975--the t-statistic for a 95% confidence interval and 157 degrees of freedom--was used. Where the upper and lower bounds of the confidence interval indicated a wide range of responses, analysis of variance (ANOVA) was performed.

Analysis of Variance. For this study, ANOVA is a parametric statistical procedure that tests the significance of the difference among more than two means when only one independent variable is used (35:281). In using the ANOVA, some assumptions were made about the population from which the data was gathered. These assumptions were:

1. The observations are independent.
2. The observations are sampled from a normal distribution.
3. The measurement variables are at least interval. In this study, the interval data was obtained by using the five point Likert scale (32:223).

In this case, the independent variables were demographic variables such as level of assignment, nature of job and education level. The means to be compared were associated with the different groups belonging to each demographic variable. The significance level used was .10. For test purposes the null hypothesis used was: the

population means for all groups are equal. When the null hypothesis was rejected by the ANOVA test (p-value < .10), it was indicative that specific differences between the population means did exist and the means of the groups were not equal. Because, however, ANOVA does not specify which means are different--only that some differences exist--additional analysis was required. In this instance, further testing was conducted using the multiple t-test comparison procedure.

Multiple Comparison Procedure. The t-test is a multiple comparison procedure that makes two or more comparisons among three or more means (32:232). For these particular t-tests an alpha level of .05 was used. The multiple t-test allowed the identification of certain groups within demographic variables where the responses varied significantly.

Summary. All data analysis was conducted using the SAS software. The software package allowed the compilation of descriptive statistics, means, confidence intervals and ANOVA. The specific commands used were PROC FREQ (for the descriptive statistics), PROC MEANS, FINDT (for the confidence intervals), and PROC ANOVA with the t-option (for the multiple comparison).

Steps for Investigative Questions 1,2 and 3

The first three investigative questions were:

1) How does the new Air Force mission of Information Management differ from that of Administration?

2) What are the educational background and knowledge base recommended for Information Managers?

3) What skills should Information Managers possess?

These questions were answered by the literature review. The body of knowledge gained from answering these questions formed the basis of this study.

Answering the first question established whether the mission of the career field had indeed changed and, if so, how. In doing so, new tasks and their associated areas of knowledge were isolated.

Answering the second question was equally important. It was necessary to show that throughout literature a consensus existed as to the educational background and knowledge base an information manager should possess. To further support the literature reviewed, IM/MIS curricula of five well-known colleges/institutions (as determined by specialized MIS programs or research facilities) were reviewed. This information was deemed necessary to ensure that the standard (ACM recommendations) used for comparison in this thesis was also the standard used by the most prominent IM/MIS institutions. The review of curricula was

limited to five undergraduate and graduate (10 total) institutions due to the time constraint placed upon this research.

Question three was answered by the literature review also. A variety of skills listings composed by MIS researchers were examined and have been provided in the appendices. The ACM skills listing, however, was found to be the most comprehensive and up-to-date, and, as such, was used as the standard of comparison for this thesis as well as a basis for the survey design.

Steps for Investigative Question 4

Investigative question four asked: What are the educational backgrounds of officers currently assigned to the IM career field? An analysis of this question was made possible through information provided by the Air Force Manpower and Personnel Center (AFMPC). A listing of all the academic degrees of 70XX (IM) officers was provided. This listing allowed the evaluation of the type and level of degree held by IM officers currently on duty.

Steps for Investigative Questions 5, 6 and 7

Investigative questions 5, 6 and 7 were:

5) Which skills are IM officers currently using on the job?

6) Which skills do IM officers perceive they possess?

7) In which skills do IM officers perceive they need training?

As explained earlier, means, confidence interval, and ANOVA analysis were used to answer to the fifth, sixth, and seventh investigative questions. The individual skills were grouped according to the ACM guidelines in order to better analyze the general areas of knowledge IM officers use on the job, possess, and require training in. Specifically, these three investigative questions were answered using the six skills categories of people, computers, systems, organization, model, and society skills.

Steps for the Specific Objective

The specific objective of this study was to determine if the current corps of IM officers possess the educational background and knowledge base recommended for IM professionals. This objective was met by, first of all, determining exactly what the new IM mission is. Secondly, the educational backgrounds and knowledge base of officers currently in the field was compared to the recommended profile found in the literature. This information was enhanced by comparing it to a compilation of IM officer perceptions as to skills used on the job, skills possessed and skills in which training is needed.

The results of this study identified the educational strengths and weaknesses of IM officers. These results were used as the basis for recommendations provided to SAF/AAD for use in planning future training and recruiting programs.

IV. ANALYSIS OF LITERATURE REVIEW, AFMPC MATERIAL, AND SURVEY RESPONSES

Introduction

This chapter addresses the information and data gathered in the process of this study. Specifically, it is an analysis of the data that is directly applicable to the investigative questions. Because the necessary data was gathered from three primary sources--literature review, AFMPC material, and survey--this chapter is divided accordingly.

Literature Review

The literature review provided a lengthy discussion of the "old" Air Force mission of administration as opposed to the "new" Air Force mission of information management. It also allowed the comparison of qualifications required of an administration officer as opposed to that of an information management officer. To avoid repeating much of what has been previously stated, a brief summary of these findings follows.

Although both the mission statement for Administration and the mission statement for Information Management addressed the handling of "information," there was a distinct change in orientation from the "old" to the "new." The current IM mission is to propose, develop, and implement

policy to manage information in any form throughout its life cycle, whereas the previous mission was to simply provide the systems, services, and resources for its processing. Most importantly, however, today's IM career field is tasked with managing information as a valuable resource--something information has not been considered to be in the past. In the process of managing this new resource, many additional activities and a wider range of knowledge are required. For example, in addition to knowledge requirements established for Administration officers, today's Information Management officers must also possess, or at least be familiar with, knowledge concerning information management systems. Although many IM officer duties remain the same as before, there are many more which are quite new. Of these new duties, many are technically oriented and computer dependent.

The literature review also provided an extensive discussion of the educational background and skills that are recommended for IMs. Although there are a number of recommendations concerning both, most of them are simply variations on a common theme. On the whole, it was found that any Information Manager should have an educational background which consists of, at least, computer science, management science, and organization science. Although other curriculum recommendations were reviewed, this thesis

focuses on the ACM recommendations. These recommendations fully outline specific courses needed for an IM background at both the undergraduate and graduate level (see Appendices E and F). An educational background consisting of areas of study as outlined by the ACM provides a solid foundation and knowledge base for the development of critical IM skills.

As for specific skills, the literature review also covered the recommendations of a variety of experts in the field. Despite the fact that each expert approached the identification of the skills needed and/or used by information managers in a different manner, a similar "core" of essential skills emerged (see Appendix B). Because the ACM skills listing is widely used and representative of the other listings discussed in the literature review, it was used as a basis for the survey portion of this thesis. Essentially, the ACM recommends that any IM should have people skills, computer skills, systems skills, model skills, organization skills, and society skills.

In summary, the literature review provided answers to the first three investigative questions. With these questions answered, it was appropriate to examine the current conditions in the career field.

AFMPC Material

In order to assess the educational backgrounds of the 70XX officer corps, AFMPC was asked to provide a compilation

of statistics concerning the types and levels of degrees held by these same officers. AFMPC agreed to provide the statistics; however, the compilation of data which addressed the entire career field would have two limitations. First of all, the information concerning educational levels and academic specialty would be based upon the most recent occurrence only. That is, if an individual possessed a Bachelor's Degree in Computer Science and a Master's Degree in Math, only the Master's Degree in Math would be considered. Such a tracking system allowed a one-to-one match-up between officer and degree so that the total number of reported degrees would equal the total number of officers assigned to the career field. Secondly, because the official titles of degrees vary greatly, related degrees would be grouped into general categories. The general categories that would cover the spectrum of 70XX officer degrees were: Computer/Technical, Business Management-Administration, Arts/Humanities/Education, Biology/Agricultural Sciences, Aeronautical/ Engineering, Law, Math, Medical Sciences, Physical Sciences, and Social Sciences. With these limitations in mind, a standard inquiry run of the AFMPC ATLAS database was performed.

Statistics Breakdown. As of 27 Jan 90, the data from the ATLAS inquiry showed that there were a total of 2,073

70XX officers in the Air Force. A breakdown by education level and grade is shown in Table #1.

Table 1

70XX Officers by Education Level and Grade

Educ. Level	Grade	Tot.	Computer Tech.	Bus-Admin Mgt	Arts/Human. Education	Bio./Agric. Sciences	Aero Eng.	Law	Math	Med. Sci.	Phys. Sci.	Soc. Sci.
High School Plus	2Lt	2	1	0	0	0	0	0	0	0	0	1
	Col	1	0	1	0	0	0	0	0	0	0	0
		3										
Bach.	2Lt	175	12	43	34	6	1	0	2	5	0	71
	1Lt	183	12	37	43	9	12	1	5	1	4	59
	Capt	588	31	161	149	18	12	0	6	10	4	197
	Maj	82	2	31	16	2	1	0	0	1	0	29
	LtCol	23	1	5	6	0	0	0	0	0	0	11
	Col	8	0	3	3	0	0	0	0	0	0	2
		1059										
Masters	2Lt	2	0	0	0	0	0	0	0	0	0	2
	1Lt	38	1	16	7	0	0	0	0	2	0	12
	Capt	549	20	241	89	1	5	0	0	3	0	190
	Maj	223	14	103	26	1	6	0	0	1	1	71
	LtCol	145	7	66	26	1	2	0	1	0	0	42
	Col	36	5	18	4	0	0	0	0	0	0	9
		993										
PhD.	Capt	7	0	0	4	0	0	1	2	1	0	0
	Maj	4	0	0	1	0	0	0	2	0	1	0
	LtCol	4	0	0	1	0	0	0	2	0	1	0
	Col	1	0	0	0	0	0	1	0	0	0	0
		18										
Total:		2071										

(26:1-2)

Table 1 accounts for a total of 2071 officers. The educational background of the two remaining officers was classified as unknown so they were not included in the analysis. As for educational level, the statistics showed that three officers possessed a high school plus education,

1059 officers possessed a bachelor's degree, 993 possessed a master's degree, and 18 possessed a doctorate.

Match-up. Once the general degree categories used by the ATLAS database were known, an effort to match them with ACM recommended areas of knowledge was made. The general topic areas of people, computers, systems, models, organizations, and society were paired with the degree category to which they were most closely related. This comparison is shown in Table 2.

TABLE 2

ATLAS DEGREE CATEGORY AND ACM TOPIC AREA MATCH-UP

ATLAS DEGREE CATEGORY	ACM TOPIC AREA
Computer/Technical	Computers Systems
Business-Administration Management	People Organizations
Arts/Humanities/Education	People Organizations
Aeronautics/Engineer	Computers Systems Models
Law	Society
Math	Models
Social Sciences	Society

(2:784-785;26:1)

The general degree categories provided by AFMPC but not listed in Table 2 were determined as not directly applicable to the knowledge base recommended for information managers. Because the degree categories provided by the ATLAS database inquiry were "general," that the match-up between them and the ACM categories was purely subjective. Every effort was made to match similar areas of study, but the possibility remains that ACM topic areas may have been covered in a general degree category and not indicated as such. Furthermore, the variations in curriculum from institution to institution made it virtually impossible to determine exactly what, if any, IM background a particular officer may have had.

Educational Background. Once a comparison was established, a general evaluation of the educational backgrounds of the career field was performed. Table 3 indicates the number of 70XX officers who were determined as having an educational background which included any of the ACM recommended areas of study. The AFIT IRM graduates (which meet all IM education requirements) were included in the computer/technical category.

TABLE 3

PERCENT OF CAREER FIELD WITH IM BACKGROUND

ACM TOPIC AREA	MATCHING ATLAS GENERAL DEGREE CATEGORY	NO. OFFICERS WITH RELATED BACKGROUND	SUBTOTAL PERCENTAGE
Computer/ Systems	Computer/ Technical	106/2071	145/2071 = 7.0%
	Aeronautics/ Engineer	39/2071	
People/ Organization	Business-Admin Mgt	725/2071	1134/2071 = 54.7%
	Arts/Humanities	409/2071	
	Education		
Models	Math	14/2071	14/2071 = .6%
Society	Law	6/2071	706/2071 = 34.0%
	Social Sciences	700/2071	
			Total 96.3%

NOTE: 3.7% of the career field has a background unrelated to Information Management.

(2:784-785;26:1-2)

An analysis of this data showed that 96.3% of the career field has a background that includes some education that is appropriate to the field of Information Management. Of those, 88.7% have a background in the topic areas of people, organizations, and society. In contrast, only 7% of the career field has a computer or systems related degree. Furthermore, a separate ATLAS inquiry identified (of that 7%) only 2.1% of the career field as possessing a "pure" Information Resource Management degree. These last two statistics were alarming in light of the information brought

forth in the literature review; only 7% of the officers in the IM career field--a career field that is becoming increasingly technical and computer-oriented--have any computer or systems related educational background. On the other hand, however, the 70XX officer corps is very well prepared for the people, organizations, and society issues associated with its new mission.

Survey

Purpose. The survey used in this study was designed primarily to answer the remaining investigative questions: Which skills do Information Managers currently use on the job? Which skills do Information Managers possess? And, in which skills do Information Managers perceive they need training?

In addition to a few summary questions, the survey used an identical set of 35 skills to evaluate each of the investigative questions. Each set of 35 skills was broken down further into subgroupings of people, computer, systems, models, organization, and society skills. By analyzing the responses to these skills questions, it was possible to evaluate which areas of knowledge/education 70XX officers perceived were:

1) currently required in the performance of duties;
2) currently possessed, and
3) currently in need of training.

Validity and Reliability. In addition to its basic format, the survey was designed with concepts of validity and reliability firmly in mind. Of the various types of validity that may be illustrated by a measurement tool--content, criterion-related, and construct validity-- content validity was the most apparent in this particular survey instrument. The Information Management Skills Assessment Survey (see Appendix H) met the criteria for content validity in that it provided adequate coverage of the topic under study (Business Methods:95). Similarly, it addressed the specific concerns brought forth in the investigative questions. Additionally, a pre-test of the survey was performed and the respondents had no difficulty understanding the topics addressed and the ultimate purpose of the survey. Because the survey itself was exploratory in nature, it did not meet the criteria for either criterion-related or construct validity. These criteria, however, could be incorporated in similar follow-on studies.

The reliability of the survey instrument was tested using the Cronbach-Alpha test (Business Methods:99-100). Three Cronbach-Alpha tests were performed--one test per each of the three sections of the survey. The results of these tests indicated that each section of the survey did indeed answer the investigative question for which it was designed. More specifically, the results of the Cronbach-Alpha tests

were coefficient alphas of .9642, .9632, and .9561 respectively. In other words, the coefficient alphas indicated the confidence level with which it can be said that the survey questions provided the correct answers to the investigative questions. Overall, the results of the Cronbach-Alpha tests indicated that the survey instrument was highly reliable.

Survey Demographics. The survey was sent to the entire population of FAC 1100 officers (225) stationed both in the CONUS and overseas. A 72.4% return rate was achieved; however, due to some unusable and incomplete survey answer sheets, only 70.2% (158 surveys) were used in the analysis. Descriptive statistics concerning the demographics of the officers surveyed are listed in Tables 4-9. The specific information addressed includes respondents' rank, command, organization level, job type, education level, and AFSC.

TABLE 4

RESPONDENTS BY RANK

RANK	FREQUENCY	PERCENTAGE
2Lt	4	2.5
1Lt	4	2.5
Capt	82	51.9
Major	43	27.3
Lt Col	19	12.0
Colonel	6	3.8
TOTAL:	158	100%

TABLE 5

RESPONDENTS BY COMMAND

COMMAND	FREQUENCY	PERCENTAGE
SAC	26	16.5
TAC	24	15.2
MAC	18	11.4
USAFE	18	11.4
ATC	16	10.1
PACAF	9	5.7
ESC	2	1.3
AU	3	1.9
AFSC	12	7.6
AFCC	5	3.2
AFLC	5	3.2
*Other	20	12.5
TOTAL:	158	100%

*Other responses can be found in Appendix I.

TABLE 6

RESPONDENTS BY ORGANIZATION LEVEL

ORGANIZATIONAL LEVEL	FREQUENCY	PERCENTAGE
Base	86	54.4
MAJCOM	43	27.2
Air Staff	9	5.7
SOA/DRU	8	5.1
*Other	12	7.6
TOTAL:	158	100%

*Other responses can be found in Appendix I.

TABLE 7

RESPONDENTS BY JOB TYPE

JOB TYPE	FREQUENCY	PERCENTAGE
Chief, Director of IM	97	61.4
Plans and Programs	19	12.0
Forms Management	4	2.5
Admin Communications	2	1.3
Records Management	1	.6
Publications Management	5	3.2
Forms Management	2	1.3
*Other	28	17.7
TOTAL:	158	100%

*Other responses can be found in Appendix I.

TABLE 8

RESPONDENTS BY EDUCATION LEVEL

EDUCATIONAL LEVEL	FREQUENCY	PERCENTAGE
Bachelor's Degree	13	8.2
Bachelor's Degree Plus	27	17.1
Master's Degree	100	63.3
Master's Degree Plus	18	11.4
TOTAL:	158	100%

TABLE 9

RESPONDENTS BY DUTY AFSC

CURRENT DUTY AFSC	FREQUENCY	PERCENTAGE
7024	9	5.7
7034	15	47.5
7016	6	3.8
7046	61	38.6
*Other	7	4.4
TOTAL:	158	100%

*Other responses can be found in Appendix I.

Summary Questions. Before examining the information gathered related to the specific skills groups, an overview of the respondent's general attitudes was obtained by reviewing the frequency and/or means of responses to the survey summary questions. These summary questions were:

1) Do you perceive that the role of the "new" IM officer is different from that of the "old" Administration officer?

2) How many of the skills (on a seven-point scale ranging from none to practically all) which you regard as relevant to today's Air Force Information Manager officer do you perceive you presently possess?

3) How many of the skills (on the same scale) which you regard as relevant to the Air Force Information Management officer of the future do you perceive you presently possess?

The primary purpose in asking these questions was to determine the general frame of mind of the respondents--have they recognized the change in mission? How do they generally feel about the skills they possess for performing their current and future duties?

In response to the first question, 86.7% said "yes," they perceived the role of the "new" IM officer as different from the "old" Administration officer. This large

percentage indicated that a majority of the survey respondents were aware of the new IM mission and its requirements.

The responses to the next two questions were not as clear cut; however, the mean responses were 4.88 and 3.94 respectively. These means indicated that on the average the officers surveyed perceived that they possessed a little more than half of the skills they felt were relevant to their current job. Additionally, they perceived that they possessed only about half of the skills they felt were relevant to their future job. These findings provided a general idea of what the overall survey might show--today's IM officers do not perceive they possess all the necessary skills to perform their current IM duties as well as their perceived future duties.

Skills Questions. Once the summary question responses were reviewed, it was necessary to analyze, in-depth, the remaining portion of the survey. Again, this portion of the survey addressed the three remaining investigative questions:

5) Which skills are Information Management officers currently using on the job?

6) Which skills do Information Management officers perceive they currently possess?

7) In which skills do Information Management officers perceive they need training?

Analyzing this portion of the survey began with an examination of the mean replies. The actual means for each investigative question are located in Table 10. As mentioned earlier, specific question responses were grouped into their related area of knowledge (i.e. people skills, system skills, computer skills, organization skills, model skills, and society skills) in order to provide a more meaningful evaluation. In order to make use of the five-point Likert scale in evaluating the mean responses, it was also necessary to round to the nearest whole number, allowing the mean responses to be directly correlated with a choice on the Likert scale. The choices were: 1=strongly disagree, 2=disagree, 3=neither agree nor disagree, 4=agree, and 5=strongly agree. The associated Likert scale mean response for each investigative question and skills group is shown in Table 11.

In examining Table 10 it is apparent that some means fell between two adjacent Likert scale choices rather than centering on any one choice. A further investigation of these particular means is provided in a later section of this analysis.

TABLE 10

SURVEY FINDINGS CONCERNING SKILLS

IM SKILLS CURRENTLY USED ON THE JOB

Skills Grouping	Mean Response	Rounded Response
People Skills	4.565	5
Systems Skills	3.234	3
Computer Skills	2.369	4
Organizational Skills	3.397	3
Model Skills	2.098	2
Society Skills	3.637	4

IM SKILLS CURRENTLY POSSESSED

Skills Grouping	Mean Response	Rounded Response
People Skills	4.572	5
Systems Skills	3.055	3
Computer Skills	2.178	2
Organizational Skills	3.340	3
Model Skills	2.333	2
Society Skills	3.761	4

IM SKILLS IN NEED OF TRAINING

Skills Grouping	Mean Response	Rounded Response
People Skills	2.446	2
Systems Skills	3.531	4
Computer Skills	3.450	3
Organizational Skills	3.469	3
Model Skills	3.137	3
Society Skills	3.259	3

TABLE 11

MEAN RESPONSES AND CORRESPONDING LIKERT SCALE RESPONSES

	Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
	(1)	(2)	(3)	(4)	(5)
PEOPLE SKILLS					
Used on the Job					X
Possess					X
Need Training		X			
SYSTEM SKILLS					
Used on the Job			X		
Possess			X		
Need Training				X	
COMPUTER SKILLS					
Used on the Job				X	
Possess		X			
Need Training			X		
ORGANIZATION SKILLS					
Used on the Job			X		
Possess			X		
Need Training			X		
SOCIETY SKILLS:					
Used on the Job				X	
Possess				X	
Need Training			X		

Skills Results. In some skills areas the means revealed valuable information.

People Skills. It was evident that the IM officers surveyed agreed strongly that they used these skills on the job, that they possessed the skills, and did not feel they needed training in these skills. In light of the information gathered concerning the educational background of the career field, these results were expected.

Model and Society Skills. The mean responses to model skills and society skills, although in some ways different, showed a similar pattern. The mean responses to the first two questions were decidedly opposite--IM officers disagreed that they used model skills on the job and disagreed that they possessed model skills, while they agreed that they used society skills on the job as well as possessed them. The similarity between responses was found in the reply to the third question (In which skills do you perceive you need training?)--both responses were "neither agree nor disagree." The similarity seemed to indicate, and was supported by the responses to the other skills categories, that where IM officers agreed or disagreed that they used skills on the job and possessed those same skills, they were undecided as to the necessity for training in those same skills. Interestingly enough, the responses to the model and society skills groups also mirrored the information uncovered concerning the educational background of the IM officer corps. With only .6% of the career field

having a background involving model skills and 34% having a background in society skills, the results of the survey were supportable.

The mean responses to the remaining skill categories did not follow any particular pattern. In fact, the high incidence of "neither agree nor disagree" mean responses required the use of further testing for analyzing the possible meaning and/or correlation.

Computer Skills. The first skills group to be examined in this manner was the computer skills group. The computer skills group was of particular interest due to the information gathered in the literature review which indicated that the new IM mission is and will become even more technology (computer) oriented. The mean responses to the investigative questions concerning computer skills indicated that the IM officers surveyed: 1) agreed that they used these skills on the job; 2) disagreed that they possessed these skills; and 3) neither agreed nor disagreed that they needed training. This last response was quite confusing in that it could be expected that these officers should desire training if they have to use the skills but do not possess them. Further analysis was performed to see if the responses were truly a "neither agree nor disagree" responses or whether they were representative of a split of agree and disagree responses. Upon examination it was found

that the standard deviation was 1.05, which seemed, in comparison to other standard deviations, quite large. Subsequently, a 95% confidence interval was calculated and it was found that 95% of the responses fell between 3.285 and 3.615. Because this did not indicate split responses, a one-way ANOVA was performed to see if there were any significant differences between the mean responses to the questions in relation to the various demographic variables. The ANOVA p-values indicated that there were no significant differences in means related to the demographic variables. Although these analyses did not provide definitive answers as to reasons for the neutral response, it was concluded that, in general, the response to the third investigative question was more positive (leaning toward agree) than negative (leaning toward disagree). The most significant conclusion that could be made, however, was that the officers surveyed were truly undecided as to whether they needed training in computer skills.

Systems Skills. The mean responses for the systems skills group also did not provide much indication of the true perceptions of the officers surveyed. The means did, however, show that the officers "neither agreed nor disagreed" that they both used systems skills on the job and possessed systems skills. In contrast, the mean response to a perceived need for training indicated that the officers

agreed they needed systems training. Because the mean responses did not fit an expected and/or logical pattern they were also analyzed in further depth. Following the same method of analysis as was used with computer skills responses, the standard deviation for both of the "neither agree nor disagree" means was examined. The standard deviations were both .986 with 95% confidence intervals of (3.088, 3.388) and (2.901, 3.209), respectively. Despite the standard deviation, the confidence intervals indicated 95% of the responses were indeed centered on the "neither agree nor disagree" response. To further investigate these neutral responses, ANOVA and multiple comparison t-tests were used once again. All demographic variables, including rank, nature of job, and education level were used in the test to see if these were any significant differences between mean responses. In this case, the ANOVAs and t-tests yielded some interesting results.

In examining the responses according to the demographic variable, education level, it was found that there was no significant difference in the means associated with the systems skills used on the job question.

The ANOVA, however, indicated that there was a significant difference (p=.0205) between the means associated with the systems skills possessed question. On the whole, those officers with increased education levels

agreed more that they possessed systems skills. Another ANOVA was performed to examine the possible difference in mean responses according to the demographic variable organizational level. The ANOVA p-value of .0481 indicated a significant difference between means did exist. The subsequent t-tests revealed that the higher the organization level, the less respondents "agreed" that they possessed systems skills.

The ANOVAs and t-tests allowed a closer and more in-depth look at the neutral ("neither agree nor disagree") mean responses for the systems skill group questions one and two. As for question one, the ANOVA and t-tests did not isolate any demographic variable where the mean responses were significantly different than neutral. As a whole, the respondents "neither agreed nor disagreed" that they used systems skills on the job. As a result of this finding, it was hypothesized that the questionnaire may have been too technically worded; therefore, the respondents did not understand the questions and could not determine whether they are used on the job or not. As for question two, the ANOVA and t-tests indicated that both education level and organizational level do, in fact, affect which systems skills an Information Management officer perceives he/she possesses. It makes sense that the more education an officer has, the more skills he/she will possess--these

findings are supportable. The most important finding, however, was that at the higher levels of the Air Force Information Management field there are less and less officers who perceive they possess systems skills.

In light of the information provided by analyzing the first two questions, the mean "agree" response to the third question (In which skills do you perceive you need training?) did not seem unusual; those officers who do not possess systems skills or are not aware of them at all should "agree" that they needed training.

Organization Skills. The final group of skills to be examined was organization skills. The mean response to all three questions were "neither agree nor disagree." Because the neutral answers to all three questions did not provide much pertinent information, further analysis was performed. The examination of confidence intervals indicated that 95% of the mean responses were between (3.235, 3.558), (3.183, 3.497), and (3.303, 3.635), respectively. Although these confidence intervals were not unexpectedly wide, further analysis was performed due to the mid-range (location between the "neither agree nor disagree" option and the "agree" option) of the means, which were 3.397, 3.340, and 3.469, respectively. The results of ANOVAs for all three organization skills questions indicated there were

significant differences between mean responses associated with the demographic variables of organization level and education level. The p-values associated with the demographic variable, organization level, were .0896, .0551, and .0517 for the three questions respectively. On the whole, the base-level responses were significantly different from MAJCOM responses as were MAJCOM responses from Air Staff responses. Base-level respondents agreed more that they used systems skills on the job and disagreed that they possessed the skills. As a result, they also agreed that they needed training. These results were mirrored in higher organization level comparisons. The p-values associated with education level indicated that significant differences existed between the mean responses to organization skills possessed and in need of training--these p-values were .0702 and .0343 respectively. Once again, the higher the educational level, the more organization skills the respondents perceived they possessed. Accordingly, the more skills they possessed, the less they perceived they needed training.

Skills Summary. The analysis of the skills data provided a large amount of potentially confusing information. The following explanation will give a short summary of the findings. As for people skills, the IM officers surveyed perceived that they used them on the job,

possessed them, and did not require training in them. The results were different concerning model skills. On the average, the respondents perceived that they did not use model skills on the job, they did not possess model skills, and were undecided whether they needed training. Once again, respondents were very positive about society skills--they perceived they used them on the job, possessed them, but were undecided as to the need for training. As for systems skills, the respondents were undecided about using the skills on the job and possessing the skills. These neutral answers, however, were actually an average of opposing responses from officers of different education and organization levels. The officers did, however, agree that they needed training in these skills. Finally, the respondents were undecided as to the responses to all three questions regarding organization skills. Once again, these undecided responses were averages of significant differences in opinion between officers of different education and organization levels.

Question Comparisons. After performing the in-depth analysis of the skills groups and their related survey questions, a comparison of the information obtained was made to that of the summary questions. Although the responses to the summary questions indicated that today's IM officers feel that they possess only about half of the skills that

they perceive are relevant to their current jobs, the other survey question responses indicated that, on the whole, these same officers perceived they possess people and society skills only and need training in systems skills only. This comparison showed that the summary and specific question replies did not necessarily match. Some possible reasons for the disagreement between summary and specific skills questions were hypothesized to be: 1) the skills used as a basis for the specific were too complicated and unfamiliar to the survey participants, 2) the respondents may have perceived that, on the whole, they did not possess all the skills necessary but were undecided as to the specific skills used in the survey, and 3) the present "published" IM mission is unclear--the respondents perceive that they need new skills but they are undecided as to which specific ones.

Open-ended Questions. Once the pure data analysis of the survey was completed, a review of the survey write-in comments was performed. It was hoped that these comments would prove helpful in interpreting the numerical survey results.

The majority of responses to the first open-ended question stated that prior educational experience in the areas of management, psychology, and communications had prepared the officers well for their current roles as

Information Managers. In contrast, however, the lack of proper computer/systems knowledge and training had left them unprepared; a large percentage were very concerned that they possessed little or no computer-related knowledge or skills. Similar recurring comments mentioned that although the need for computer-related knowledge and skills had only recently begun to "trickle down" in the IM field, the officers perceived that the requirement would become even more pronounced in the future. A majority of the officers surveyed were disturbed that they did not have the skills, knowledge, or training to perform the new mission. Addressing the IM training provided by the Air Force, one respondent replied:

> "I've had to take computer courses on my own and even purchased a computer system out-of-pocket. . . because my past education has not been useful to the current trend in the information management career field."

This response was not unusual. Many respondents replied that they only way they have been able to keep up with computer technology is to enroll in courses, read, and visit seminars on their own. Another respondent summarized:

> [Because the quantity and currency of Air Force training courses is lacking] I don't think we've done a very good job of educating our officers for the new responsibilities that have come with the transition from Administration to Information Management.

Additionally, one MAJCOM IM sent the survey back. After completing only twenty of the survey questions, he wrote:

> I have decided to return your survey without completing it. I don't think my responses will be of much help to your purposes. As you can see, I started but it was clear after several questions that somebody in my position probably can't respond in any useful way.

Although this IM made no distinction between whether he felt his responses would be of no help because of his position or knowledge, the few survey responses he did complete indicated that he was either unfamiliar with the skills listed or not using them on the job. This response shows that the knowledge and skills shortage is not limited to our field officers.

In contrast, there was a small percentage of respondents who replied their education had prepared them well for all their present duties. All such respondents commented that they either possessed computer science-related backgrounds, or were AFIT IRM graduates.

As for the second opened-ended question ("How has your educational background prepared you for your future role as an IM?"), the responses mirrored those of the first question, but were much more involved. Most respondents replied that their backgrounds did not prepare them for their future role as Information Management officers. They foresaw their jobs as being dominated by computers and the use of computer technology to manage information. This view was reflected in the following reply:

> [I perceive] that the future responsibilities of the IM officer includes management of small computers,

> stand-alone computer systems, microcomputers, wordprocessors, copiers, and dedicated computer systems for graphics, accounting, decision support . . . electronic mail, and other means of transmitting information through local network and telecommunication systems.

In most cases, as a follow-up to the comments addressing the inadequacy of their educational background for their future roles, respondents remarked of the impact this inadequacy will have on the career field. One such comment was:

> We can't afford to remain in the dark ages and have someone else or some other agency tell us what we need to do, otherwise we'll disappear as an unimportant career field. IM needs specialty training and educational direction to ensure our future.

Another related comment specified:

> If the majority of our officers don't receive training, the result [will] be inefficient service to customers and incompetent, ineffective leaders.

Once again, however, a few respondees said that they were well prepared for their future responsibilities. As in the first question, many of these individuals were AFIT IRM graduates. Others, however, reported being assigned to support (as opposed to functional IM) billets. These particular individuals stated that 70XX executive officer, protocol and section commander positions did not require any additional knowledge above and beyond that of the "old" Administration officer. This point was reiterated in a comment by a respondent who felt he was prepared for his

future role because he perceived that the mission never really changed. His quote was as follows:

> The career field has taken on a new name; however, most people still think of us as paper pushers. We have a long way to go before there will be a change. The career field needs to be ["sold"] to senior level management on our new found specialty if we are to be recognized for our new important role.

Despite the differing viewpoints, the general tone of the write-in comments indicated that the officers in the career field possessed an overabundance of people, organizational, communication, and management skills. On the other hand, they lacked computer, systems, and math skills and desperately needed training in those same areas. Generally, the respondents were concerned that if gap between what education is provided and what is needed is not bridged, the career field will most certainly suffer.

This chapter presented the findings from the data analysis. The next chapter will present the conclusions which have been drawn from this information.

V. FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

Introduction

The primary purpose of this thesis was to compare the educational background and knowledge base recommended for information management professionals to that currently possessed by Air Force Information Management officers. Due to the volume of data and literature analyzed in the course of this thesis, there were a number of instances where, in addition to solid, supporting information, conflicting information was also presented. Because of this conflicting information, it was impossible, in some cases, to answer decisively each investigative question. Despite these difficulties, this chapter will provide the most reasonable and supportable conclusions to each of the seven investigative questions as well as an overall conclusion. This chapter will conclude with recommendations concerning both the future application of this research and appropriate follow-on research.

Investigative Question #1

This research showed without a doubt that the published Information Management mission is quite different from the previous Administration mission. The change in mission placed new demands and requirements on the 70XX officer

corps. The IM mission is, in many ways, similar to its older administration counterpart; however, a variety of computer-oriented, technology-based duties is now required. Despite the fact that the new mission was outlined and new requirements for officers were established, some sectors of the career field have yet to recognize or be impacted by the change. This finding helped explain why the distinction between administration and information management is much clearer in published form (i.e., mission statements, job descriptions) than is obvious from actual on the job tasks.

Investigative Question #2

The literature revealed that Information Managers should be knowledgeable in the topic areas of people, computers, systems, models, organizations, and society. In more general terms, they should have an educational background which includes at least computer science, management science, and organizational science. A variety of Information Management societies have proposed IM/MIS curricula which, if taken, will ensure a proper Information Management educational background. This thesis focused on the curriculum proposed by the most prominent society--the ACM. Their curriculum recommendation provides a listing of core course topics to be covered in each of the six general areas of knowledge mentioned above. This curriculum recommendation is provided, in full, in Appendix E. A

review of five undergraduate and graduate IM/MIS programs indicated that not only was the ACM curriculum in wide use but also very applicable to the current needs of the Information Management field. It follows from the information gathered that if individuals have participated in educational curricula similar to that recommended by the ACM, they possess the educational background and knowledge base necessary to be Information Managers.

Investigative Question #3

Because the terms "knowledge of" and "knowledge base" were so broad, it was determined that an examination of individual IM skills was necessary. The relationship between knowledge and skill was identified in the literature review--knowledge is necessary for skill; hence skill is an indication of knowledge. The literature review uncovered three IM skills listings (see Appendices A, B, and C). Although these skills listings were different in format, the skills generally fell into the six general categories previously devised by the ACM--people skills, computer skills, systems skills, model skills, organization skills, and society skills. Overall, the literature supported the conclusion that if individuals possess a majority of the skills listed, they are qualified to be Information Managers.

Investigative Question #4

The material provided by AFMPC emphasized the imbalance between the non-technical and technical educational backgrounds of the current corps of IM officers. While 96.3% of the officers have a background which includes some knowledge determined necessary to perform the duties of an Information Manager, only 2.1% have a pure IRM background. Responses to the survey reiterated this point; a majority of the officers responded that their backgrounds were in a non-technical field. On the whole, the career field is composed of officers with educational backgrounds which have not adequately prepared them to perform the Information Management mission.

Investigative Question #5

The results of the survey indicated that the skills required in performance of current duties are only a portion of those described in the literature review. In cases where a majority of skills were being used on the job, the respondents were assigned to computer/systems-related duties. Many of today's Information Managers spend a majority of their time dealing with non-technical issues. The type of skills that the officers polled agree that they currently use are: people, computer, and society. As for other types of skills (systems, model, and organization), the officers were unsure or disagreed that they used them.

The most support for the requirement for IM technical skills was provided by the write-in responses, which indicated the requirement for computer-related, technical skills is on the rise. Many officers stated that computer/systems skills were becoming necessary in the performance of day-to-day operations. From these responses it was concluded that although many of the skills required on the job today are the same as before the mission change, there is a trend toward a requirement for more technical, information management-related skills.

Investigative Question #6

The responses to the survey indicated that, without question, the only skills participants agreed they possessed were people and society skills. The write-in responses also supported these findings. The respondents also disagreed that they possessed computer or model skills and were undecided as to systems and organization skills. The findings concerning computer and model skills were also supported by the write-in responses. This split between non-technical and technical skills shows that current Information Management officers do not possess all the necessary skills required to perform the new mission.

Investigative Question #7

The survey results concerning the skills in which officers perceived they needed training did not provide much relevant information. To only one skills group--systems--did the survey participants agree they needed training. As for the other skills groups, they either disagreed or were neutral. The disagree or neutral responses, in all but one case--people skills--did not reflect the skills requirement or the skills possessed responses. For example, concerning computer skills, the respondents agreed they used them on the job, disagreed they possessed them, but then were undecided as to whether they needed training or not. However, a review of these results in light of other information seems to indicate that both the uncertainty about the true mission of Information Management and the future of the Information Management career field may have been a influencing factor. If officers are not sure of the skills requirement they will be faced with or the future of the career field, it may follow that they will be undecided or disagreeable as to the need for training.

The write-in responses, however, indicated a tremendous need and desire for training in computer and systems skills. A moderate need for model skills training was also expressed. On the whole, the write-in responses were so adamant and concerned about the need for computer and

systems skills training, it was concluded that perhaps the need for training portion of the survey was confusing or improperly worded, therefore, providing inconclusive results. In response to this investigative question, the officers in the career field deem they need training in computer, systems, and some model skills.

Thesis Conclusion

The mission of the career field has changed--Information Management is much more technically oriented than Administration. Additionally, a majority of the current corps of Information Management officers do not have an educational background that addresses the critical topic areas associated with Information Management. In essence, these officers have been given a job which they are unprepared educationally to perform. Although a majority of pure Information Management skills are not yet required in performance of daily duties, the officers surveyed are encountering them more frequently. In general, many officers know the mission has changed and are beginning to experience the change; however, they are not sure what to expect in the future. They do know, however, that, if officers in the field continue to lack the proper knowledge and skills, both the career field and the Air Force, as a whole, will suffer. The concept of IRM is based on the idea that information is now a valuable resource--a resource that

is becoming even more critical to the continued operation of the Air Force. If Air Force leaders expect our information resources to be managed effectively, efficiently, and, most of all, competently, our IM officers must be educated and trained to do so.

Recommendations

In order to improve the quality of the Information Management career field as well as its officers, the following recommendations are made:

1) When bringing new officers into the career field, ensure their educational backgrounds qualify them to be information managers. A proper background is one that is comparable to the ACM recommended curriculum.

2) Officers currently assigned to the career field should received IM education and training as soon as possible if the career field is to continue functioning. Currently, the most critical needs are in the areas of computers and systems. Knowledge and skills in these areas can be provided through courses addressing topics such as: computer concepts and software systems; program, data and file structures; database management systems; information systems; and systems design.

3) A more explicit definition of the Information Management mission is needed. The general objective of

the IM seems relatively well-defined; however, the specific responsibilities and duties remain unclear. If there were no question as to IM responsibilities, recommending and providing the proper education and training for IM officers would be much easier.

Further Research

This thesis effort breached a variety of topics which included educational background (knowledge base), skills, and training. Although the backgrounds of the entire officer corps were evaluated, the survey portion was quite narrow in that it focused on the opinions and replies of functional Information Management officers only. Because these officers compose only 10% of the Information Management officer corps, a majority of the officers in the career field remain unaddressed. As such, a similar study aimed at Information Management officers occupying support billets would be appropriate for follow-on research. Also, because this study identified that the pure Information Management mission has not trickled down to all Information Managers, a repeat of this study at a later date would also be appropriate. The final recommendation for further study focuses on IM training. This thesis effort identified that our IM officers are not educationally qualified to perform the IM mission. A logical follow-on to this effort would be research which reviews officer

training. Is current IM officer training addressing the educational deficiencies of the IM officer corps?

Appendix A: Guimarae's Skills Listing

1. Phase 1: Feasibility Study Skills

101 Develop viable alternatives in specifying information systems.
102 Analyze and determine cost/benefits of a project.
103 Knowledge of computer products available.
104 Define positive/negative impacts of a project.
105 Define key issues in a functional area of the organization.
107 Apply the system approach within the organization.
108 Knowledge of user departments practices/procedures.
109 Data collection for specific information needs/ flows.
110 Data collection techniques.
111 Determine user commitment.
112 Time and cost estimations.
113 Delegate assignments and review results.
114 Sign off documentation.
115 Time and activity charting (Gantt, CPM, etc)
119 User training on system life cycle.
120 Knowledge of computer resources and systems development costs.

2. Phase 2: System Analysis Skills

201 Analyze and evaluate software/application packages.
202 Knowledge of general systems theory.
203 Recognize appropriate management science models for common situations.
204 Knowledge of Government regulations affecting projects.
205 Develop and document computer/manual specifications for a project.
206 Knowledge of charting techniques.
207 Develop a tree chart for a project requirement.
208 Construct decision tables.
210 Determine control/audit techniques.

3. Phase 3: System Design Skills

301 Database considerations.
302 Data definition (subschema).
303 Prepare clear/useful documentation.
304 Plan user documentation.

305 Plan user training.
306 Prepare administrative procedures.
307 Prepare system design documentation.
308 Design I/O layouts.
309 Develop code structures.
310 Develop implementation plan (how, when).
311 Knowledge of computer performance evaluation techniques.
312 Knowledge of human performance evaluation techniques.
313 Keeping current with technology in EDP/related areas.
314 Knowledge of timesharing capabilities.
315 Understanding of data security capabilities.
316 Understanding of hardware/software capabilities.
317 Apply control/audit techniques.
318 Refine cost/benefits evaluation of a project.
320 Know characteristics of auxiliary storage devices.
321 Know file accessing techniques.
324 Evaluation/selection of language for the project.
326 Knowledge or file oriented languages.
327 Know utilities and other special packages.
328 Understand complex data structures.
329 Understand multiprogramming and multiprocessing.
330 Understand compilers, interpreters.
331 Know communication system access methods.
332 Understand complex storage structures.

4. Phase 4: Program Design Skills

401 Design detailed program specifications.
402 Develop program structure charts (Chapin).
403 Knowledge of sorting techniques.
404 Know timesharing packages.
405 Know operating system enough to design run decks.
406 Evaluate and select file accessing methods.

5. Phase 5: Programming (Analyst as a Consultant) Skills

501 Write an operational computer program.
502 Ability to convert computer programs to a different language.
503 Use detailed program specifications.
505 Debug programs.
504 Test programs.
506 Use program testing aids.
507 Program in appropriate language.

508 Ability to create, maintain, and interrogate files.
509 Use interactive programming facilities.
510 Use table searching techniques.
511 Create and use library routines.
512 Structured walk through.

6. Phase 6: System Testing Skills

601 Develop operational system.
602 Initialize database.
603 Train users in system use.
604 Test computer procedures.
605 Debug computer procedures.
606 Prepare sample data, schedule test runs.
607 Analyze programs for detailed design/construction.
608 Construct a test plan.
609 Debug administrative procedures.
610 Test administrative procedures.

7. Phase 7: Implementation Skills

701 Install the operational system.
702 Implement the database.
703 Prepare turnover requirements.
704 Prepare final user documentation for project.
705 Give system operational demonstration.

8. Phase 8: Systems Audit Skills

801 Determine if system met cost/benefit evaluation.
802 Compare estimated versus actual development/production costs.
803 Evaluate system performance for improvement.
804 Use of performance evaluation techniques.
805 Evaluate personnel performance.

9. Phase 9: Maintenance Skills

901 Periodically report maintenance activity to management.
902 Implement an operational revision to existing system.
904 Revise existing programs and documents consistent with shop standards.

10. Phase 10: Skills Used in All Phases

001 Present a detailed description of a project to management.
002 Make oral and written presentation.
003 Cooperate and work effectively with others.
004 Implement a project consistent with installation standards.
005 Understand corporate policy and lines of authority and responsibility.
006 Communicate with peers.
007 Communicate with non-computer oriented people.
008 Accept responsibility.
009 Dependable.
010 Flexible.
011 Train and develop subordinates.
012 Leadership abilities.
013 Delegate assignments and review the results.
014 Initiative.
015 Willingness to discuss problems.
016 Work independently with limited supervision.
017 Problem identification.
018 Handle a number of assignments simultaneously.
019 Creativity and innovativeness.
020 Motivate self.
021 Use project planning and control.
022 Perform tasks accurately (quality).
023 Level of output (quantity).
024 Plan and organize work assignments.
025 Complete assignments on time.
026 Work effectively under pressure.
027 Listening skills.
028 Communicate with management.
029 Communicate with subordinates.
030 Motivate others.

Appendix B: ACM Skills Listing

1. People
   - Ability to hear others as well as listen to them
   - Ability to describe individual and group behavior and to predict likely alternative future behavior in terms of commonly used variables of psychology and economics
   - Ability to describe and predict task-oriented, time-constrained behavior in an organizational setting

2. Models
   - Ability to formulate and solve simple models of the operations research type
   - Ability to recognize in context the appropriate models for situations commonly encountered

3. Systems
   - Ability to view, describe, and define any situation as a system--specifying components, boundaries, and so forth
   - Ability to apply this "systems viewpoint" in depth to some class of organization--manufacturing firms, government bureaus, universities, hospitals, service providers, etc.
   - Ability to perform an economic analysis of proposed resource commitments (includes ability to specify needs for additional information and to make a set of conditional evaluations if information is unavailable)
   - Ability to present in writing a summary of a project for management action (suitable to serve as a basis for decision)

4. Computers
   - Knowledge of basic hardware/software components of computer and communication systems and their patterns of configuration
   - Ability to program in a higher level language
   - Ability to program a defined problem involving data files and communications structures
   - Ability to develop several logical structures for a specified problem
   - Ability to develop several different implementations of a specified logical structure

Ability to develop specifications for a major programming project in terms of functions, modules, and interfaces

Knowledge of sources for updating knowledge of technology

Ability to develop the major alternatives (assuming current technology) in specifying an information processing system, including data files and communications structures, to the level of major system components

Ability to make an economic analysis for selecting among the alternatives above, including identification of necessary information for making that analysis, and also to identify non-economic factors

Ability to make "rough-cut" feasibility evaluations (in terms of economic and behavioral variables) of proposed new techniques or applications of current technology, identifying critical variables and making estimates and extrapolations

Ability to develop specifications for the computer-based part of a major information system, with details of task management and database management components

5. Organizations

Knowledge of the function of purposeful organizational structure and the major alternatives for that structure

Knowledge of the functional areas of an organization--operations, finance, marketing, product specification, and development

Ability to identify in an ongoing organizational situation the key issues and problems of each functional area

Knowledge of typical roles and role behavior in each functional area

Ability to identify possible short-term and long-term effects of a specified action on organizational goals

Ability to identify information needs appropriate to issues and roles above

Knowledge of how information systems are superimposed on organizational patterns on the operational control, and planning levels

Knowledge of techniques for gathering information

Ability to gather information systematically within an organization, given specified information needs and/or specified information flows

Ability to specify, given information needs and

sources, several alternative sets of information transfers and processing to meet needs

Ability to make "rough-cut" feasibility evaluations of such alternatives

Ability to develop positive and negative impacts of a specified information system on specified parts of an organization

Ability to develop specifications for a major information system addressing a given organizational need, and to determine the breakdown into manual and computer-based parts

6. Society

Ability to articulate and defend a personal position on some important issue of the impact of information technology and systems on society (important, as defined by Congressional interest, public press, semi-technical press, etc.)

Ability to perceive and describe several positive and several negative impacts of a specified information system in a specified part of society

Ability, given such specifications of impacts, to perform a "rough-cut" feasibility analysis of them in terms of behavior and economic variables

Appendix C: Crossman's Cluster of 'Systems Analyst' Skills

GROUP 1: Business Acumen Cluster
- Forecasting business trends
- Skills in accounting/finance/economics
- Skills in general business practices
- Skills in organization and methods
- Skills in user department functional area
- Working in the user department

GROUP 2: Change Agent/Creative Cluster
- Acting as a change agent
  - Acting as a catalyst
  - Combatting resistance to change/coping with resentment about change
  - Confronting
  - Enforcing
  - Imposing
  - Influencing
  - Innovating
  - Mediating
- Identifying competitive advantages/positions
- Identifying the impact of change
- Using information competitively
- Using information technology strategically

GROUP 3: Computational Cluster
- Forecast modelling
- Mathematical skills
  - Mathematics
  - Mathematical modelling
- Statistics
- Simulation skills

GROUP 4: Evaluative Cluster
- Auditing computer-based systems
- Developing quality assurance standards/procedures
- Evaluating implemented systems
  - Determining system performance
  - Ensuring user requirements are met
  - Reviewing applications
- Ensuring the security of developed systems

GROUP 5: Human Issues Cluster
- Communicating
  - Identifying the receivers' frame/register
  - Interviewing
  - Negotiating

Preparing presentations
Selling ideas/persuading/gaining acceptance
Using body language
Verbal communicating
Public speaking
Listening
Written communication
Documenting
Specifying
Report writing
Writing manuals
operations
user

Interpersonal skills
Arbitrating
Being patient
Being politically aware
Cooperating
Enhancing
Participating
Skills in relating to people/organization
Skills in working in/through others/team
Skills in ergonomics

GROUP 6: Investigating Cluster
Analytical skills/evaluating the existing situation
Decomposing tasks
Analyzing data flows
Identifying/analyzing data elements/information
Viewing/defining any situation as a system

Fact finding/data gathering skills
Interviewing/questioning/investigating
Observing
Searching records/reviewing documents
Sampling
Using questionnaires
Becoming informed

Problem solving
Identifying/recognizing problems
Analyzing problems
Logical thinking
Identifying correct solutions
Identifying corporate system needs/requirements
Strategic planning
Using formal procedures (e.g. information engineering)

Identifying corporate data requirements

Identifying individual system needs/requirements
Identifying system goals
Identifying user needs
Determining data (sic) requirements
Reconciling user requirements
Determining appropriate controls/security
Determining system feasibility
Cost-benefit analyzing
Risk assessing/risk analyzing

GROUP 7: Performance Cluster
Accepting (e.g. instructions, orders, etc.)
Attending to detail
Being accurate
Being disciplined/orderly
Being organized
Being self-directed
Comprehending
Decision making
Enhancing own skill
Gaining experience
Keeping records/note taking
Learning/Gaining knowledge/Remembering/
Understanding
Thinking logically/Deductive reasoning
Working without immediate results

GROUP 8: Project Management Cluster
Administrating
Allocating work/Prioritizing tasks/Scheduling
Budgeting
Controlling workers/Controlling quality of
work/Enforcing standards
Coordinating work
Critical-path analyzing
Delegating
Developing people
Evaluating subordinates needs
Forecasting
Initiating/instigating
Leading/directing
Measuring work
Comparing/Monitoring
Correcting
Evaluating/Verifying work
Reviewing performance
Motivating
Organizing/structural personnel

Planning
Reporting on systems development
Rewarding/Punishing
Setting objectives
Signing off development stages
Skills at charging out for services

GROUP 9: Savant Cluster
Consulting (e.g. for end user computing)
 Advising
 Enabling
 Encouraging
 Facilitating
 Guiding
 Helping
 Supporting

Evaluating
 Products
 Methodologies
 Technology
Keeping abreast with technology
 Instructing
  Educating
  Teaching
  Training

GROUP 10: Systems Acquisition/Technical
 Identifying appropriate approach
 Building competitive positions
 Designing audit/control procedures (audit
  trails)
 Designing user workflows
 Recognizing different world views

 Computer based systems
  Deciding on software acquisition method
   Building systems to meet user needs
    Building systems which can be audited
    Identifying/using appropriate methodologies

 Using appropriate tools
    Estimating time/cost/resources
    Designing codes
    Designing data flows
    Designing inputs/outputs
     dialogues
     forms
     man-machine interfaces
     reports

screens
Designing procedures
Designing source documents
Designing system function/conceptual designing
Generating applications
Programming: third generation
Programming: fourth generation
Prototyping: requirements only
Prototyping: whole system
Skills at appropriate design methods
Specifying programs/systems
Structuring algorithms
Using automated development tools
Using charting techniques
Using computer-based aided design
Using development work stations
Using pseudo-code

Acquiring application packages
Evaluating/selecting packages
Tuning purchased software
Implementing packages

Acquiring hardware (communication/processing)
Designing hardware requirements
Evaluating/selecting hardware
Specifying hardware requirements

Determining data requirements
Controlling data redundancy/normalizing data
Designing data structures
Designing/creating files
Ensuring data independence
Ensuring data integrity
Logical data modelling
Separating physical/logical
data structure
Using data dictionaries
Providing input to data dictionaries
Working with database administrator

Manual systems
Designing manual procedures
Designing manual systems
Implementing manual systems

Implementing systems
Skills at conversion procedures
Testing systems
Test data designing

Testing developed systems
Implementing appropriate systems

Maintaining systems
Sharing responsibility of system with the user

Appendix D: Comparison of 70XX Officer Qualifications

AFR 36-1 January 1989

AFSC 7016-Administration Officer

a. Knowledge. Knowledge is mandatory of: human relations and management principles and techniques; and in-depth understanding of USAF organization, command structure, and staff arrangement and operation.

b. Education. Master's degree in management, business, or public administration is desirable.

c. Experience. Full qualification is mandatory as an Executive Support Officer. Also, a minimum of 12 months experience is mandatory in development and operation of management programs and internal management policies and information systems in support of command management objectives.

d. Training. Completion of an administration or management analysis course is desirable.

AFR 36-1 September 1989

AFSC 7016 Information Management Officer

a. Knowledge. Knowledge is mandatory of: human relations and management principles and techniques; and in-depth understanding of USAF organization, information management systems, command structure, and staff level operations.

b. Education. Master's degree in information resource management, business or management, public administration, computer technology, or human resource management is desirable.

c. Experience. Full qualification is mandatory as Information Management, Executive Officer. Also, a minimum of 12 months staff level experience is mandatory.

d. Training. Completion of management theory, organizational analysis and behavior, and systems management courses is desirable.

AFR 36-1 January 1989

AFSC 7024 Administration Officer

a. Knowledge. Knowledge is mandatory of: principles of business or public administration, human relations, and consultative techniques.

b. Education. Undergraduate academic specialization in management, business, or public administration is desirable.

c. Experience. A minimum of 12 months experience is mandatory in executive support assignment. It is mandatory that experience include developing, coordinating, and performing management functions.

d. Training. Completion of administration or management analysis course is desirable.

AFR 36-1 September 1989

AFSC 7024 Information Management Officer

a. Knowledge. Knowledge is mandatory of: principles of business or public administration, information management systems, human relations, and consultative techniques.

b. Education. Undergraduate academic specialization in information resources management, computer science, systems management, business or management, public administration, or human resource management is desirable.

c. Experience. A minimum of 12 months experience is mandatory in executive support assignments.

d. Training. Completion of the Information Management Basic Officer Course and systems or information technology and management courses is desirable.

AFR 36-1 January 1989

AFSC 7034 Administration Officer

a. Knowledge:
(1) Knowledge is mandatory of: production or industrial management principles, and administration and management of personnel.

(2) Knowledge is desirable of: concepts of analysis for management, involving performance evaluation, integrated program analysis, and use of statistical analysis techniques; familiarization with automated systems and electronic data processing as tools for management analysis; and systems analysis to assist in allocation of resources in achieving command objectives.

b. Education. Undergraduate academic specialization in management or public or business administration is desirable.

c. Experience.
(1) A minimum of 18 months experience is mandatory in an administration management assignment. It is mandatory that experience include the development and operation of administration programs such as information systems management and publications and forms management; document security and transmission; official mail and message processing; printing, duplicating, and reprographics services;records management; or postal and courier service operations.

(2) Experience is desirable in all facets of administration management.

d. Training. Completion of an administration, management engineering, or management analysis course is desirable.

AFR 36-1 September 1989

AFSC 7034 Information Management Officer

a. Knowledge:
(1) Knowledge is mandatory of production or industrial management principles, and administration and management of personnel.

(2) Knowledge is desirable of concepts of analysis for management, involving performance evaluation, integrated

program analysis, and use of statistical analysis techniques; familiarization with automated systems and electronic data processing as tools for management analysis,; and systems analysis to assist in resource allocation in achieving command objectives.

b. Education. Undergraduate academic specialization in information resource management, computer technology, system management, business or public management, administration, or human resource management is desirable.

c. Experience:
(1) A minimum of 18 months experience is mandatory.

(2) Experience is desirable in all facets of information management.

d. Training. Completion of the Chief, Information Management Officer Course, and management engineering, management analysis, systems or computer technology, and personnel management courses is desirable.

AFR 36-1 January 1989

AFSC 7046 Administration Officer

a. Knowledge. Knowledge is mandatory of: production and industrial management principals; business or public administration; human relations; management of resources and organization; and operation of printing, duplicating, distribution, postal, records, administrative security, orders, and written communications functions.

b. Education. Master's degree in management, business, or public administration is desirable.

c. Experience. Full qualifications is mandatory as an Administration Management Officer. Also, a minimum of 12 months experience is mandatory in development, evaluation, management, coordinating of administration systems and processes.

d. Training. Completion of administration management analysis, management engineering, or data processing and automation course is desirable.

AFSC 7046 Information Management Officer

a. Knowledge. Knowledge is mandatory of: production and industrial management principles; business or public administration; information management systems; human relations; resource and organization management; and operation of printing, duplicating, distribution, postal, records, information security, orders, and written communications functions.

b. Education. Master's degree in information resource management, computer technology, business or management, human resource management, or public administration is desirable.

c. Experience. Full qualification is mandatory as an Information Management Officer. Also, a minimum of 12 months experience is mandatory in development, evaluation, management, and coordination of information management systems and processes.

d. Training. Completion of the Chief, Information Management Officer Course, management analysis, management engineering, and computer or system technology and management courses is desirable.

Appendix E: ACM Curriculum Recommendations

The degree program in information systems has three components with sets of courses of for each:

1. IS technology
2. IS concepts and processes
3. organization functions and management

The course structure for the graduate curriculum has two courses not proposed for the undergraduate program. These two courses reflect the greater managerial emphasis of the graduate program and the greater depth of instruction for graduate students.

Information Systems Technology

IS1 Computer Concepts and Software Systems
IS2 Program, Data, and File Structures
IS4 Database Management Systems
IS6 Data Communication Systems and Networks
IS7 Modeling and Decision Systems (graduate program only)

Information Systems Concepts in Organizations

IS3 Information Systems in Organizations
IS5 Information Analysis
IS8 Systems Design Process
IS9 Information Systems Policy (graduate program only)
IS10 Information Systems Projects

AACSB Common Body of Knowledge

The AACSB accreditation standards specify that degree programs in business and administration include in their course of instruction in the equivalent of at least one year of work comprising the following areas:

(a) a background of the concepts, processes, and institutions in marketing and distribution, production, and financing functions of business enterprise

(b) a background of the economic and legal environment of business enterprise along with consideration of the social and political influences on business

(c) a basic understanding of the concepts and methods of accounting, quantitative methods, and informa tion systems

(d) a study of organization theory, interpersonal relationships, control and motivation systems, and communications

(e) a study of administration processes under conditions of uncertainty including integrating analysis and policy determination at the overall management level.

Appendix F: DPMA Curriculum Recommendations

CIS 86-1 Introduction to CIS

CIS 86-2 Microcomputer Applications in Business

CIS 86-3 Introduction to Business

CIS 86-4 Intermediate Business Applications Programming

CIS 86-5 System Development Methodologies: A Survey

CIS 86-6 Data Files and Databases

CIS 86-7 Information Center Functions

CIS 86-8 System Development Project

Appendix G: Institution MIS Curricula Reviewed for Compliance With ACM Curriculum Recommendations

Undergraduate Programs

1. Illinois Institute of Technology
2. Pennsylvania State University at Harrisburg
3. Texas Tech University
4. University of Colorado at Colorado Springs
5. University of Texas at Arlington

Graduate Programs

6. New York University
7. University of Arizona at Tucson
8. University of California Berkeley
9. University of Maryland College Park
10. University of Minnesota

Appendix H: Information Management Skills Assessment Survey

USAF Survey Control Number 90-24

NOTE: Parts I-III use **identical** skills lists to elicit **different** responses. Please be sure to preface each set of answers with the proper phrase.

Part I. The following questions pertain to the skills you are required to use on the job.

For each item, use the following scale to indicate the level of your agreement or disagreement with statement

Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
1	2	3	4	5

My current job requires me to have the skills necessary to...

1. describe and identify individual and group behavior (e.g. describe and identify working relationships among people in an organizational environment)

2. listen to and understand others

3. effect changes in work relationships

4. gain the confidence and support of others in work relationships

5. recognize, understand, and communicate the meanings of particular events as I seem them.

6. analyze, evaluate, and implement a variety of software packages

7. perform economic analyses (cost/benefit studies) of proposed resource commitments for projects

8. analyze and determine costs and benefits of projects (information systems) to users

Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
1	2	3	4	5

9. specify, given information needs and sources, several alternative sets of information to meet needs

10. analyze programs written by others (systems analysts, contractors, etc.) for detailed design and construction

11. make "rough-cut" feasibility evaluations of proposed new techniques or applications of current technology

12. understand general systems theory (open/closed systems, system boundaries, feedback concept, etc)

13. utilize "outside" computer services (information concerning consultants, software houses application packages, etc.)

14. write detailed program specifications

15. convert existing programs from one system to another (language to language, computer to computer)

16. program in fourth generation languages

17. analyze communication systems (estimate line and terminal requirements, volume and message length, queues, etc)

18. analyze and evaluate different hardware configurations

19. determine existing communications facilities (line types, exchanges, utilities)

20. determine/evaluate proper auxiliary storage devices (storage capacity, etc)

21. determine/evaluate input-output devices (types available, general market characteristics, etc)

22. determine positive and negative impacts of a specified information system on specified parts of the organization

Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
1	2	3	4	5

23. identify possible short term and long term effects of a specified action on organizational goals

24. develop specifications for a major information system, addressing a given organizational need, and determine the breakdown into manual and computer-based parts

25. define the function of purposeful organizational structure and the major alternatives for that structure

26. gather data and prepare long range information systems plans

27. formulate and solve simple operations research type models (linear programming, dynamic programming, queuing, etc.)

28. recognize the appropriate operations research model for situations commonly encountered

29. utilize matrix algebra in solving problems

30. utilize differential calculus and optimization in solving problems

31. utilize elementary statistics in solving problems

32. utilize the fundamentals of probability theory in solving problems

33. evaluate the impact of computers on clerical and managerial positions

34. understand the privacy issues and its implications on data banks

35. evaluate the social consequences of a proposed system

Part II. The following questions concern the skills you currently possess (whether you use them on the job or not).

For each item, use the following scale to indicate the level of your agreement or disagreement with the statement

Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
1	2	3	4	5

I have the skills necessary to...

36. describe and identify individual and group behavior (e.g. describe and identify working relationships among people in an organizational environment)

37. listed to and understand others

38. effect changes in work relationships

39. gain the confidence and support of others in work relationships

40. recognize, understand, and communicate the meanings of particular events as I see them

41. analyze, evaluate, and implement a variety of software packages

42. perform economic (cost/benefit studies) of proposed resource commitments for projects

43. analyze and determine costs and benefits of projects (information systems) to users

44. specify, given information needs and sources, several alternative sets of information to meet needs

45. analyze programs written by others (systems analysts, contractors, etc.) for detailed design and constructions

46. make "rough-cut" feasibility evaluations of proposed new techniques or application of current technology

47. apply general systems theory (open/closed systems, system boundaries, feedback concept, etc.)

Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
1	2	3	4	5

48. utilize "outside" computer services (information concerning consultants, software houses, application packages, etc.)

49. write detailed program specifications

50. convert existing programs from one system to another (language to language, computer to computer)

51. program in fourth generation languages

52. analyze communication systems (estimate line and terminal requirements, volume and message length, queues, etc.)

53. analyze and evaluate different hardware configurations

54. determine existing communications facilities (line types, exchanges, utilities)

55. determine/evaluate proper auxiliary storage devices (storage capacity, etc)

56. determine/evaluate proper input-output devices (types available, general market characteristics, etc)

57. determine positive and negative impacts of a specified information system on specified parts of the organization

58. identify possible short term and long term effects of a specified action on organizational goals

59. develop specifications for a major information system, addressing a given organizational need, and determine the breakdown into manual and computer-based parts

60. define the function of purposeful organizational structure and the major alternatives for that structure

Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
1	2	3	4	5

61. gather data and prepare long range information systems plans

62. formulate and solve simple operations research type models (linear programming, dynamic programming, queuing, etc.)

63. recognize the appropriate operations research model for situations commonly encountered

64. utilize matrix algebra in solving problems

65. utilize differential calculus and optimization in solving problems

66. utilize elementary statistics in solving problems

67. utilize the fundamentals of probability theory in solving problems

68. evaluate the impact of computers on clerical and managerial positions

69. understand the privacy issue and its implications on data banks

70. evaluate the social consequences of a proposed system

Part III. The following questions address your perceptions as to your training needs.

For each item, use the following scale to indicate the level of your agreement or disagreement with the statement

Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
1	2	3	4	5

I perceive that I need training in the skills necessary to...

71. describe and identify individual and group behavior (e.g. describe and identify working relationships among people in an organizational environment)

72. listen to and understand others

73. effect changes in work relationships

74. gain the confidence and support of others in work relationships

75. recognize, understand, and communicate the meanings of particular events as I see them

76. analyze, evaluate, and implement a variety of software packages

77. perform economic analyses (cost/benefit studies) of proposed resource commitments for projects

78. analyze and determine costs and benefits of projects (information systems) to users

79. specify, given information needs and sources, several alternative sets of information to meet needs

80. analyze programs written by others (systems analysts, contractors, etc.) for detailed design and construction

81. make "rough-cut" feasibility evaluations of proposed new techniques or applications of current technology

Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
1	2	3	4	5

82. apply general systems theory (open/closed systems, system boundaries, feedback concept, etc.)

83. utilize "outside" computer services (information concerning consultants, software houses, application packages, etc.)

84. write detailed program specifications

85. convert existing programs from one system to another (language to language, computer to computer)

86. program in fourth generation languages

87. analyze communication systems (estimate line and terminal requirements, volume and message length, queues, etc.)

88. analyze and evaluate different hardware configurations

89. determine existing communications facilities (line types, exchanges, utilities)

90. determine/evaluate proper auxiliary storage devices (storage capacity, etc.)

91. determine/evaluate proper input-output devices (types available, general market characteristics, etc.)

92. determine positive and negative impacts of a specified information system on specified parts of the organization

93. identify possible short term and long term effects of a specified action on organizational goals

94. develop specifications for a major information system, addressing a given organizational need, and determine the breakdown into manual and computer-based parts

Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
1	2	3	4	5

95. define the function of purposeful organizational structure and the major alternatives for that structure

96. gather data and prepare long range information systems plans

97. formulate and solve simple operations research type models (linear programming, dynamic programming, queuing, etc.)

98. recognize the appropriate operations research model for situations commonly encountered

99. utilize matrix algebra in solving problems

100. utilize differential calculus and optimization in solving problems

101. utilize elementary statistics in solving problems

102. utilize the fundamentals of probability theory in solving problems

103. understand the impact of computers on clerical and managerial positions

104. understand the privacy issue and its implementations on data banks

105. evaluate the social consequences of a proposed system

Part IV. Summary Questions. The following questions address your overall perceptions about the skills possessed by Information Management officers.

106. How many of the skills which you regard as relevant to **today's** Air Force Information Management office do you feel you presently possess?

None			About Half			Practically All
1	2	3	4	5	6	7

107. How many of the skills which you regard as relevant to the Air Force Information Management officer of the **future** do you feel you presently possess?

None			About Half			Practically All
1	2	3	4	5	6	7

Part V. The following questions elicit demographic information of Information Management officers.

108. What is your age group?

1. 20-25
2. 26-30
3. 31-35
4. 36-40
5. 41-45
6. 46 and over

109. What is your sex?

1. Female
2. Male

110. What is your current rank?

1. 2d Lt
2. 1st Lt
3. Capt
4. Major
5. Lt Col
6. Colonel

111. To which command are you currently assigned?

1. SAC
2. TAC
3. MAC
4. USAFE
5. ATC
6. PACAF
7. one of the above (go to next question)

112. To which command are you currently assigned?

1. ESC
2. AU
3. AFSC
4. AFCC
5. AFLC
6. other _____ (write in)

113. To what organizational level are you currently assigned?

1. Base level
2. MAJCOM level
3. Air Staff level
4. SOA/DRU level
5. other _____ (write in)

114. What is the general nature of your job?

1. Chief/Director of Information Management
2. Plans and Programs
3. Printing Management
4. Administrative Communications
5. None of the above (go to the next question)

115. What is the general nature of your job?

1. Records Management
2. Publications Management
3. Forms Management
4. other _____ (write in)
5. None of the above

116. What is your highest educational level?

1. Bachelor's degree
2. Bachelor's degree plus
3. Master's degree
4. Master's degree plus
5. Doctoral degree

117. How many years active military service do you have?

1. Less than 4 years
2. 4 years but less than 8
3. 8 years but less than 12
4. 12 years but less than 16
5. 16 years but less than 20
6. 20 years or more

118. What is your current duty AFSC?

1. 7024
2. 7034
3. 7016
4. 7046
5. other _____ (write in)

119. How many total years have you been assigned to the career field? (i.e. How long have you been a 70XX officer?)

1. Less than 4 years
2. 4 years but less than 8
3. 8 years but less than 12
4. 12 years but less than 16
5. 16 years but less than 20
6. 20 years or more

120. How many years have you been in your current job?

1. Less than 1 year
2. 1 year but less than 2
3. 2 years but less than 3
4. 3 years but less than 4
5. 4 years or more

121. Do you perceive that the role of the "new" Information Management officer is different from that of the "old" Administration officer?

1. Yes
2. No

Part VI. Open-ended Questions. (Use the back if necessary)

122. Please provide any comment on how well your past education experience has prepared you to fulfill the current role of Information Management officer.

123. Please provide any comments on how well your past education experience has prepared you for what you perceive are the future responsibilities of Information Management officers.

Appendix I: Summary of "Other" Responses

The following is a summary of the "other" responses annotated in the demographic portion of the survey.

Table 1

COMMAND

AAC
AF SPACECOM
AFCOMS
AFDW

Table 6

ORGANIZATION LEVEL

Both MAJCOM & Base
NAF
GSU

Table 7

JOB TYPE

Squadron Section Commander
Postal Operations
Executive officer
Systems Integration
Office Systems
Program Manager
Requirements & Systems
Plans & Human Resources
Security

Table 9

DUTY AFSC

7041
7031

Bibliography

1. ACM Curriculum Committee on Computer Education for Management. Curriculum Recommendations for Graduate Professional Programs in Information Systems. New York: Association of Computing Machinery, 1972.

2. ACM Curriculum Committee on Information Systems. "Information Systems Curriculum Recommendations for the 80s: Undergraduate and Graduate Programs," Communications of the ACM, 25: 781-803 (November 1982).

3. Athey, Susan. "A Comparison of Undergraduate Information Systems Programs and the DPMA Model," Interface, 10: 68-73 (Winter 88/89).

4. Benbasat, I. and A. S. Dexter. "Impact of Organizational Maturity on Information Systems Skills Needs," MIS Quarterly, 4: 21-34 (September 1980).

5. Bryce, Milt. "The IRM Idea," Datamation, 33: 89-92 (April 1987).

6. Carlson, Patricia and James C. Wetherbe. "Test MBA Programs for Reality," Computerworld, 23: 101 (March 1989).

7. Caudle, Sharon L. "IRM: A Look Backward and Forward at the Federal Level," Information Management Review, 3: 9-25 (Spring 1988).

8. Cheney, Paul H. and Norman R. Lyons. "Information Systems Skill Requirements: A Survey," MIS Quarterly, 1: 35-43 (March 1980).

9. Coleman, Capt Cheryl C. A Determination of the Perceived Computer Literacy and Computer Training Needs of Air Force Administrators. MS Thesis, AFIT/GIR/LSM/88D-1. School of Systems and Logistics, Air Force Institute of Technology (AU), Wright-Patterson AFB OH, February 1989 (AD-A204446).

10. Culnan, Mary J. and Burton Swanson. "Research in Management Information Systems, 1980-1984: Points of Work and Reference," MIS Quarterly, 10: 289-301 (September 1986).

11. Data Processing Management Association Education Foundation. "CIS '86 The DPMA Model Curriculum for Undergraduate Computer Information Systems," Interface, 8: 33 (Fall 1986).

12. Davis, Capt Carl. Class handout distributed in COMM 630, Research Methods. School of Systems and Logistics, Air Force Institute of Technology (AU), Wright-Patterson AFB OH, October 1989.

13. Davis, Gordon B. and Margrethe H. Olsen. Management Information Systems Conceptual Foundations, Structure, and Development. New York: McGraw-Hill Book Company, 1985.

14. Department of Defense. Secretary of the Air Force Order. SAFO 100.1. Washington: Government Printing Office, 21 April 1988.

15. -----. Secretary of the Air Force Order. SAFO 110.1. Washington: Government Printing Office, 19 November 1987.

16. -----. Secretary of the Air Force Order. SAFO 560.1. Washington: Government Printing Office, 7 September 1988.

17. Department of the Air Force. Administrative Management: Functions and Responsibilities of Administration. AFR 4-1. Washington: HQ USAF, 30 June 1982.

18. -----. Information Management: Functions and Responsibilities of Information Management (IM) Activities. AFR 4-1. Washington: HQ USAF, 20 December 1988.

19. Department of Management Sciences University of Minnesota. Graduate Studies in Management Information Systems. Twin Cities MN: University Relations, 1986.

20. Emory, William C. Business Research Methods. Homewood IL: Richard D. Irwin, Inc., 1985.

21. Gantz, John. "A Look Into the Future: The Personal Computing Industry at the Millenium," InfoWorld, 10: 38 (February 1988).

22. Gibbs, Norman E. "The SEI Education Program: The Challenge of Teaching Software Engineers," Communications of the ACM, 32: 594-605 (May 1989).

23. Guimares, Nestor. System Analysis Skills Hierarchy. Working Paper, MISRC-WP-80-09. Graduate School of Business Administration University of Minnesota, Minneapolis MN, February 1985.

24. Hartog, Curt and Robert A. Rouse. "A Blueprint for the New MIS Professional," Datamation, 33: 65-69 (October 1987).

25. Horton, Forest W., Jr. Information Resources Management. Newark NJ: Prentice-Hall, Inc., 1985.

26. Headquarters Air Force Manpower and Personnel Center. ATLAS Database Statistical Summary. Standard Run Batch 448. Texas: HQ AFMPC, 25 January 1990.

27. Illinois Institute of Technology. Illinois Institute of Technology Undergraduate Programs 1988-1990. Chicago: Office of Public Relations, 1988.

28. Jensen, Capt Melissa. Chief, Officer Career Matters. Telephone Interview. SAF/AADH, Washington DC, 4 Jan 1990.

29. Kirkley, John. "MIS Profession Is Not What It Used To Be," Computerworld, 22: 80-81 (March 1988).

30. Lee, David R. "The Evolution of Information Systems and Technologies," SAM Advanced Management Journal, 53: 17-23 (Summer 1988).

31. Levine, Arnold S. "Technologies for the Future," Computerworld, 23: 95,98 (March 1989).

32. Littel, Ramon C. and Sandra D. Schotzhauer. SAS System for Elementary Statistical Analysis. Cary NC: SAS Institute, Inc., 1987.

33. Nations, Colonel William O. Secretary of the Air Force Orders on Information Resources Management (IRM) and Information Management (IM). Washington: Government Printing Office, 11 September 1989.

34. New York University. Announcement of the Leonard N. Stern School of Business (Graduate Program). New York: New York University Publications, 1989.

35. Pedhauzer, Elazar J. Multiple Regression in Behavior Research. (Second Edition). New York: CBS College Publishing, 1982.

36. Pennsylvania State University. Penn State University Harrisburg Bulletin 1989-1991. Harrisburg PA: Penn State Press, 1988.

37. Pirow, P. C. and others. Information Systems In Practice and Theory. New York: North-Holland Publishing Company, 1988.

38. Rifkin, Glenn. "Top Students Shunning MIS," Computerworld, 21: 120-121 (June 1987).

39. -----. "MIS Courses Fall Short," Computerworld, 21: 1, 70-71 (June 1987).

40. Roscoe, John T. Fundamental Research Statistics for the Behavioral Sciences. New York: Holt, Rhinehart, and Winston, Inc., 1969.

41. Rouse, Robert A. and Curt Hartog. "The New MIS Profession--Part 1," Journal of Systems Management, 39: 6-10 (May 1988).

42. Sullivan-Trainor, Michael. "MIS Stares at Skills Crunch," Computerworld, 22: 1,117 (March 1988).

43. Texas Tech University. Undergraduate Catalog 1990-1991. Lubbock TX: Texas Tech Office of Official Publications, 1989.

44. Trauth, Eileen M. "The Evolution of Information Resource Management," Information and Management, 16: 257-268 (May 1988).

45. University of Arizona. University of Arizona Record. Tucson AZ: University of Arizona, 1989.

46. University of California Berkeley. Announcement of the Walter A. Haas School of Business (Graduate Program). California: Berkeley Publications, 1989.

47. University of Colorado at Colorado Springs. 1989-1990 Catalog. Colorado Springs CO: University of Colorado at Colorado Springs, 1989.

48. University of Maryland College Park. Graduate Catalog 1989-1990. College Park MD: University of Maryland College Park Press, 1988.

49. University of Texas at Arlington. Undergraduate Catalog 1989-1991. Arlington TX: University of Texas at Arlington, 1989.

50. USAF Occupational Measurement Center. Occupational Survey Report: Administration Utilization Field AFSC 70XX. AFPT 90-70X-810. Randolph AFB TX, 1988. (AD-A196935).

51. Vitalari, Nicholas P. "Knowledge As a Basis for Expertise in Systems Analysis: An Empirical Study," MIS Quarterly,9: 221-240 (September 1985).

52. Watson. Major Norman G. AFIT Graduate Student. Address to GIR Graduation Attendees. Holiday Inn, Fairborn OH, 13 December 1989.

Vita

Captain Summer E. Scott [redacted] She graduated from North Little Rock Ole Main High School as valedictorian in 1982. She then attended the United States Air Force Academy, graduating with a Bachelor of Science in Management in 1986. Upon graduation she received a regular commission in the USAF and served her first tour of duty at Reese AFB, Texas. There she held the position of Chief, Base Information Management. In that capacity, she was responsible for managing information in all forms from creation to destruction for the units of the 64th Flying Training Wing. She entered the Air Force Institute of Technology School of Systems and Logistics in May 1989.

Permanent Address: 156 High Street
No. Little Rock, Arkansas
72118

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	December 1990	Master's Thesis

4. TITLE AND SUBTITLE
AN EVALUATION OF THE EDUCATIONAL BACKGROUND AND KNOWLEDGE BASE OF AIR FORCE INFORMATION MANAGEMENT OFFICERS

5. FUNDING NUMBERS

6. AUTHOR(S)
Summer E. Scott, Captain, USAF

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Air Force Institute of Technology,
WPAFB OH 45433-6583

8. PERFORMING ORGANIZATION REPORT NUMBER
AFIT/GIR/LSR/90D-10

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSORING / MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION / AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 words)*

This study compares the educational background and knowledge base recommended for Information Management professionals to that currently possessed by Air Force Information Management (IM) officers. Areas of interest include the Air Force IM mission, recommendations concerning the proper educational background and skills for information managers, and perceptions of Air Force IM officers as to their educational background and skills. The literature review revealed that information managers should have an educational background that provides them with knowledge in the areas of people, computers, systems, models, organization, and society. Statistics made available through the Air Force Manpower and Personnel Center (AFMPC) indicated that only 2.1% of all 70XX officers have a complete information resource management background, and only 7% have a technical or computer-related background. A survey of 225 functional IM officers revealed that today's officers do indeed use, possess, and need training in certain IM skills. This information combined with that from the literature review and AFMPC statistics formed the basis of the conclusion to this thesis--on the whole, today's Information Management officers do not have the type of educational backgrounds that are recommended for Information Management professionals.

14. SUBJECT TERMS	15. NUMBER OF PAGES
Information Management, 70XX Officers, Information Management Officers, Education, Curriculum, Knowledge Base, Skills, Administration	139
	16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	UL